AIEA LANI ESTATES - PRELIMINARY SOIL REPORT

AIEA HEIGHTS, EWA, OAHU, HAWAII
TAX MAP KEY: 9-9-07: 1

To:
JAMES K. TSUGAWA AND ASSOCIATES

WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

MAY 12, 1972

WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

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May 12, 1972

JAMES K. TSUGAWA & ASSOCIATES
210 Ward Avenue, Suite 118
Honolulu, Hawaii 96814

Gentlemen:

Subject: Aiea Lani Estates
Preliminary Soil Report
(for site grading and foundation design purposes)
Aiea Heights, Ewa, Oahu, Hawaii
Tax Map Key: 9-9-07: 1

Transmitted herewith is our preliminary soil exploration report for site grading and foundation design purposes for light, 2-story residential structures for the proposed Aiea Lani Estates at Aiea Heights, Ewa, Oahu, Hawaii.

This report includes a Boring Location Plan, boring logs, laboratory test results, recommendations and limitations.

Respectfully submitted,

WALTER LUM ASSOCIATES, INC.

Ezra Koike

Ezra Koike
Professional Engineer
Hawaii No. 1450

EK:vl

C O N T E N T S

AIEA LANI ESTATES - PRELIMINARY SOIL REPORT

AIEA HEIGHTS, EWA, OAHU, HAWAII
TAX MAP KEY: 9-9-07: 1

SCOPE OF EXPLORATION

The purpose of this exploration was to determine general soil conditions for site grading and foundation design purposes for light, 2-story residential structures for the proposed Aiea Lani Estates, Aiea Heights, Ewa, Oahu, Hawaii.

This report includes field explorations, laboratory tests and general recommendations for site grading and preliminary foundation design considerations.

FIELD EXPLORATION

Twenty exploratory borings were made at the site. The locations of these borings are shown on the Boring Location Plan. Descriptions of the underlying soils encountered are shown on the boring logs.

Borings were made with 3-in. diameter augers using clay and finger type bits. Soil samples were recovered with 2-in. diameter thin-wall tube samplers and a standard split spoon sampler driven with a 140-lb hammer falling 30 inches.

LABORATORY TESTS

Laboratory tests included: natural water content and density, unconfined compression, Atterberg limit, grain-size analysis, AASHO T-180-57 density, expansion and CBR.

A list of the standard field and laboratory test methods used for this project is given in the Appendix.

A summary of the laboratory test results is given in Tables IA thru IE.

SOIL CLASSIFICATION SYSTEM

Soil samples were visually observed and subjected to appropriate tests in the laboratory. Based on visual observations and laboratory test data, the soil descriptions given on the boring logs are generally made in accordance with the "Unified Soil Classification System."

GENERAL SITE CONDITIONS

The proposed site is located along the west side of the Aiea Heights Road about 1-1/2 miles northeast of H-1 freeway.

The site is generally situated on a ridge that runs in a north-south direction. The ridge slopes down toward the south at about 2 to 8% gradient with local variations. The side slopes vary from about 10 to 80% down toward the east and west. Some gullies and swales were also noted on the side slopes.

Shrubs, trees and weeds cover most of the site.

Narrow trails were noted on the site.

An existing water reservoir is located adjacent to the southeast corner of the site.

Existing cut slopes of about 1-1/4 horizontal to 1 vertical ratio were noted along the eastern boundary next to Aiea Heights Road.

INTERPRETATION OF SOIL CONDITIONS

From the field exploration and laboratory test results, the soils may be generally described as follows:

A surface layer about 2 to 4 ft of medium brown clayey silt underlain by mottled brown and gray clayey silts with traces of decomposed rock to about 16 ft, the depths drilled.

Water was not noticed in the borings during the field exploration.

For more detailed descriptions of soils encountered in the borings, refer to the boring logs.

DISCUSSION AND RECOMMENDATIONS

In general, the present plan is to grade the central portion of the site along the top of the ridge for access roads and parking areas. Cuts and fills generally less than 15 ft in height are planned.

Light, 2-story wood-frame residential structures are proposed generally along the east and west sides of the ridge. Minimum grading is contemplated at the building sites. Post and beam type foundations are considered along sloping areas.

The proposed buildings indicated near the fairly steep slopes next to Aiea Heights Road should generally be relocated away from the tops of slopes or otherwise adjusted.

Site Grading

Because portions of the site are located on sloping areas, grading should be designed to generally avoid fills over areas steeper than about 3 horizontal to 1 vertical and to avoid thin sliver fills on sloping areas.

Before fills are placed in gullies or natural drainageways, trenches should be cut in a herringbone pattern and subdrains placed in trenches to provide drainage paths. The locations of subdrains should be determined in the field after clearing and grubbing.

Where fills are proposed, the area should be cleared and grubbed, drained and localized soft spots removed.

Provision to drain the site should be included during and after the filling operation.

In general, the on-site soils may be used for the construction of the proposed fills. Grading work should be done as required by the F.H.A. Data Sheet 79-G; Revised Ordinances of Honolulu, 1961 As Amended; and as recommended below:

1. The area should be cleared and grubbed. Surface vegetation and miscellaneous debris should be cleared and removed prior to site filling.

2. Topsoil and stockpiled soils should be either (a) stripped to stiff natural ground or (b) scarified and recompacted before the placement of fills.

3. Localized soft pockets encountered during the site preparations should be excavated and backfilled with compacted select material.

4. Hard surfaces should be scarified down to stiff soils and recompacted to match the density of the surrounding soil.

5. Where fills are proposed on sidehill areas, gullies and in drainage ditches, loose material of the bottom and sides should be stripped down to stiff natural ground before the placement of fills. New fills should be keyed into the stiff natural ground.

6. Fills should be constructed in approximately level layers starting at the lower end and working upward. Where fills are made on sloping areas steeper than about 5 horizontal to 1 vertical, the ground at the toe of the fill should be benched to a generally level condition. As the fill is brought up, it should continually be keyed into the stiff

natural ground by cutting steps into the slopes and compacting the fill into these steps.

9. Fills should be laid in 6-in. compacted layers to 90% of the maximum density determined by the AASHO T-180-57 test method.

Slopes

In general, cut and fill slopes of 2 horizontal to 1 vertical or flatter should be used.

In general, fills should be avoided on sloping areas steeper than about 3 horizontal to 1 vertical.

In cuts and fills, if slope heights of greater than 15 ft are considered, 8-ft-wide benches should be placed at height intervals of about 15 ft.

The surface of fill slopes should be compacted by cat-tracking or with a sheepsfoot roller.

Slope planting is recommended on cut and fill slopes to minimize slope erosion.

Slope adjustments or other precautions may be necessary if seepage zones or soft spots are encountered in localized areas.

Foundations

For the proposed light, 2-story structures, slab-on-ground foundations may be used for those lots that are away from sloping ground.

Next to or along the top of sloping ground, structures should be designed as a raft that will float as a unit on post-and-beam foundations that can be re-leveled should settlements occur.

The surface of side slopes tends to creep. To minimize the effects of surface creep, the foot blocks should be supported on short piles 6 to 8 ft long. The foot blocks should be tied together up and down the slope. (See Figure 1.)

The units should be made as small as practicable with floating foundations.

Odd shapes and split levels should be minimized or designed to float as a unit.

The use of masonry walls should be used with care and designed to tolerate surface creep of the ground.

Other general recommendations for foundation design, particularly for buildings away from sloping areas, are as follows:

1. Footings may be placed on existing stiff ground or on well-compacted fill.

2. Soft pockets and pockets of loose material encountered at the bottom of footing excavations should be removed and backfilled with select material.

3. The bottom of footing excavations should be recompacted before pouring of concrete.

4. Bearing values of about 1,500 p.s.f. are recommended.

5. To minimize effects of differential settlements, deep grade beams are recommended, particularly around the perimeter of the building.

6. Because of downhill creep effect of soils on the slope, structural footings should generally be placed about 15 ft from the tops of the slopes.

7. Construction of retaining walls along the tops of the slopes should be avoided.

8. Good surface drainage away from the foundations of the proposed structure should be maintained and the site should be graded at all times to prevent the ponding of water.

Concrete Slabs on Ground

For concrete slabs on ground, a base course of 4 in. of well-graded gravel less than 3/4-in. and greater than 1/4-in. in size is recommended.

The subgrade should be compacted and shaped to drain. The elevation of the subgrade should be kept higher than the surrounding ground outside the building whenever practicable.

Underground Utilities

Underground utilities should be placed after the fills are constructed.

The bottoms of utility trenches should be daylighted and graded to shed water. The backfill and drainage of these utility trenches should be carefully designed.

Flexible connections should be used.

Roadway

In general, a rough estimate of the roadway pavement thickness for the light automobile traffic anticipated is as follows:

1. Wearing course - 2-in. asphaltic concrete.
2. Base course - 6-in. base course over a prepared subgrade.

Provisions should be made in the contract documents to allow for local adjustments regarding subbase requirements in the field in accordance with the design standards of the City and County of Honolulu. In fill areas, the use of select soils within the top 2 to 3 ft of the subgrade may reduce the thickness of or eliminate the need for the subbase course.

The subgrade should be compacted and shaped to drain. To avoid the ponding of water and softening of the subgrade at low points, weep holes should be placed at subgrade levels thru the walls of the catch basins which are placed in these low areas.

Unforeseen Conditions

Unforeseen or undetected conditions such as soft spots, seepage water, expansive soil pockets or creep zones may occur in localized areas and will have to be adjusted and corrected in the field as they are detected.

PROPOSED SPECIFICATION FOR EARTHWORK

AIEA LANI ESTATES

General Description

This item shall consist of clearing and grubbing, preparing of land to be filled, excavating and filling of the land, spreading, compacting and testing of the fill, and subsidiary work necessary for grading the site.

Clearing, Grubbing and Preparing Areas to be Filled

Vegetation, rubbish and miscellaneous material shall be removed and disposed of, leaving the disturbed area with a neat, debris-free appearance.

Topsoil and stockpiled soils shall be (1) stripped to stiff natural ground or (2) scarified and recompacted before the placement of fills. Loose surface soils encountered at finish grade shall be scarified and recompacted.

Hard surfaces shall be scarified down to stiff soils and recompacted to match the density of the surrounding soil.

The bottom and sides of gullies or natural drainageways shall be stripped down to stiff natural ground before the placement of fills.

Trenches shall be cut in a herringbone pattern and subdrains shall be placed in the trenches to provide drainage paths for the bottom of the drainageway.

Materials

Fill material shall consist of selected on-site soils or approved borrow soils. The soils shall contain no more than a trace of organic and deleterious matter.

Borrow soils shall be select soils generally less than 3-in. maximum size, with more than 30% fines and a plasticity index generally less than 20.

Fill material placed in the top 2 ft of fills shall contain less than 30% gravel.

Placing, Spreading and Compacting Fill Material

The selected fill material shall be placed in level layers which, when compacted, shall not exceed 6 inches. Each layer shall be spread evenly and thoroughly blade-mixed during the spreading to insure uniformity of material and water content within each layer.

Rocks or cobbles shall not be allowed to nest, and voids between rocks shall be carefully filled and compacted with small stones or earth.

When the water content of the fill material is well below the optimum for compacting purposes, water shall be added until the water content assures a thorough bonding during the compacting process.

When the water content of the material is well above the optimum for compacting purposes, the fill material shall be aerated by blading or by other satisfactory methods until the water content is near the optimum.

After each layer has been placed, mixed and spread evenly, it shall be compacted to 90% of maximum density in accordance with AASHO Test No. T-180-57 or other comparable density tests. Compaction shall be with sheepsfoot rollers, multiple-wheel pneumatic-tired rollers or other acceptable rollers which shall be able to compact the fill to the specified density. Rolling shall be accomplished while the fill material is at the specified water content. The rolling of each layer shall be continuous over its entire area and the roller shall make sufficient passes to obtain the desired density.

Field density tests shall be made to get an indication of the compaction of the fill. Where sheepsfoot rollers are used, the soil may be disturbed to a depth of several inches. Density readings shall be taken as often as necessary in the compacted material below the disturbed surface. When these readings indicate that the density of any layer of fill or portion thereof is below the required 90% density, that layer or portion shall be reworked until the required density has been obtained.

The fill operation shall be continued in 6-in. compacted layers, as specified above, until the fill has been brought to the finished slopes and grades as shown on the accepted plans.

Excavation

Suitable material from the excavation shall be used in the fill and unsuitable material from the excavation shall be disposed of.

Unforeseen Conditions

If unforeseen or undetected critical soil conditions such as soft spots, seepage water, creep zones or expansive soil pockets are encountered, corrective measures shall be made in the field as they are detected.

Rainy Weather

Fill material shall not be placed, spread or rolled during unfavorable weather conditions. When the work is interrupted by heavy rain, fill operations shall not be resumed until field tests indicate that the water content and density are as previously specified.

BORING LOGS

The stratification lines shown on each of the boring logs represent the approximate boundary between soil types and the transition may be gradual.

Symbols

Symbols used generally are in accordance with the Unified Soil Classification System.

Where a parenthesis "(MH)" is used, the soil sample was classified by visual observation of the sample recovered.

Where no parenthesis "MH" is used, the soil sample was classified from either the Atterberg limit or sieve analysis test results.

AIEA LANI ESTATES

WALTER LUM ASSOCIATES, INC. 3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log

PROJECT: AIEA LANI ESTATES
LOCATION: Aiea Heights, Ewa, Oahu, Hawaii
Tax Map Key: 9-9-07: 1

HAMMER:
Weight: 140#
Drop: 30"
SAMPLER: 2"SS. 2"O.D. THIN WALL TUBE
2"SS. 2" STANDARD SPLIT SPOON

BORING NO. 1 Sheet No. ____ of ____
Driller: W. LUM ASSOC., INC. Date: APR. 20, 1972
Field Party: GLORY, TSUKAZAKI, RADOVICH
Type of Boring: AUGER (CONCORE AS-JR) Diam.: 3"
Elev.: 801'± * Datum: —
Drill Bit: CLAY
Water Level: NOT NOTICED
Time: —
Date: 4-20-72

Unified Soil Classification	DESCRIPTION	Depth (Ft.)	Sampler	Sample No.	Wet Dens. P.C.F.	Water Cont. %	Dry Dens. P.C.F.	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test N (Blows per foot) 0 10 20 30 40	PENETRATION DATA: 2"O.D. THIN WALL TUBE SAMPLER BLOWS/0.5'
	ELEV. = 801'± *	0									
(MH)	MEDIUM, BROWN CLAYEY SILT W/ROOTS		2"S	1-A	106	38	77	4780	—		2/.5' 6/.5'
(MH)	STIFF, REDDISH BROWN CLAYEY SILT										
(MH)	STIFF, MOTTLED RED-TAN CLAYEY SILT	5	2"SS	1-B	—	42	—	—	—		22/.5'
MH	STIFF. MOTTLED GRAY & RED, CLAYEY SILT	10	2"S	1-C	110	53	72	3280	—		3/.5' 7/.5'
						LL= 102					
	END OF BORING @ 11'					PL= 53					

* ELEVATION ESTIMATED FROM GRADING PLAN DATED FEB. 4, 1972

AIEA LANI ESTATE

WALTER LUM ASSOCIATES, INC. 3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log

PROJECT: AIEA LANI ESTATES
LOCATION: Aiea Heights, Ewa, Oahu, Hawaii
Tax Map Key: 9-9-07: 1

HAMMER: Weight 140# Drop 30"
SAMPLER: 2" SS-2" O.D. THIN WALL TUBE; 2" SS-2" STANDARD SPLIT SPOON

BORING NO. 2 Sheet No. ____ of ____
Driller W. LUM ASSOC., INC. Date APR. 20, 1972
Field Party GLORY, TSUKAZAKI, RADOVICH
Type of Boring AUGER (CONCORE AS-JR) Diam. 3"
Elev. 809'± * Datum —
Drill Bit CLAY
Water Level NOT NOTICED
Time —
Date 4-20-72

Unified Soil Classification	DESCRIPTION	Depth (Ft.)	Sampler	Sample No.	Wet Dens. P.C.F.	Water Cont. %	Dry Dens. P.C.F.	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test N (Blows per foot) 0 10 20 30 40	PENETRATION DATA: 2" O.D. THIN WALL TUBE SAMPLER BLOWS/0.5'
	ELEV. = 809'± *	0									
(MH)	MEDIUM, BROWN CLAYEY SILT W/ ROOTS		2"S	2-A	114	34 44	—	4130	—		2/.5' 5/.5'
(MH)	STIFF, REDDISH BROWN CLAYEY SILT										
(MH)	STIFF MOTTLED BROWN & GRAY CLAYEY SILT	5	2"SS	2-B	—	48	—	—	—		17/.5'
MH	STIFF MOTTLED GRAY & RED CLAYEY SILT W/TRACES OF DECOMPOSED ROCK	10	2"S	2-C	109	46 LL= 91 PL= 56	75	11440	—		6/.5' 12/.5'
	END OF BORING @ 11'										

* ELEVATION ESTIMATED FROM GRADING PLAN DATED FEB. 4, 1972

AIEA LANI ESTATES

WALTER LUM ASSOCIATES, INC. 3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log

PROJECT: AIEA LANI ESTATES

LOCATION: Aiea Heights, Ewa, Oahu, Hawaii
Tax Map Key: 9-9-07: 1

HAMMER:
Weight: 140#
Drop: 30"
SAMPLER: 2"SS - 2" O.D. THIN WALL TUBE
2"SS - 2" STANDARD SPLIT SPOON

BORING NO. 3 Sheet No. ____ of ____
Driller W. LUM ASSOC., INC. Date APR. 26, 1972
Field Party MAKAULA, KAKU
Type of Boring AUGER (MOBILE MINUTEMAN) Diam. 3"
Elev. 818'± * Datum —
Drill Bit FINGER TYPE

Water Level					
Time	—				
Date	4-26-72				

Unified Soil Classification	DESCRIPTION	Depth (Ft.)	Sampler	Sample No.	Wet Dens. P.C.F.	Water Cont. %	Dry Dens. P.C.F.	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test N (Blows per foot) 0 10 20 30 40	PENETRATION DATA: 2"O.D. THIN WALL TUBE SAMPLER BLOWS/0.5'
	ELEV. = 818'± ▽ *	0									
(MH)	STIFF, REDDISH BROWN CLAYEY SILT W/ROOTS		2"S	3-A	98	33	74	5120	—		2.5' 3.5'
(MH)	STIFF, REDDISH BROWN & GRAY, CLAYEY SILT W/ ROOTS	5	2"SS	3-B	—	43	—	—	—		
		10	2"S	3-C	109	48	73	4910	—		3.5' 4.5'
(MH)	STIFF, MOTTLED BROWN & GRAY, CLAYEY SILT	15	2"SS	3-D	—	57	—	—	—		
	END OF BORING @ 16.5'										

* ELEVATION ESTIMATED FROM GRADING PLAN DATED FEB. 4, 1972

AIEA LANI ESTATES

WALTER LUM ASSOCIATES, INC. 3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log

PROJECT: AIEA LANI ESTATES

LOCATION: Aiea Heights, Ewa, Oahu, Hawaii

Tax Map Key: 9-9-07: 1

HAMMER: Weight 140# Drop 30"

SAMPLER: 2" S. 2" O.D. THIN WALL TUBE; 2" SS. 2" STANDARD SPLIT SPOON

BORING NO. 4 Sheet No. ____ of ____

Driller W. LUM ASSOC., INC. Date APRIL 26, 1972

Field Party GLORY, RADOVICH

Type of Boring AUGER (ACKER ACE) Diam. 3"

Elev. 808'± * Datum —

Drill Bit CLAY

Water Level	NOT NOTICED				
Time	—				
Date	4-26-72				

Unified Soil Classification	DESCRIPTION	Depth (Ft.)	Sampler	Sample No.	Wet Dens. P.C.F.	Water Cont. %	Dry Dens. P.C.F.	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test N (Blows per foot) 0 10 20 30 40	PENETRATION DATA: 2" O.D. THIN WALL TUBE SAMPLER BLOWS/0.5'
	ELEV. = 808'± 7 * 0										
(MH)	STIFF, REDDISH BROWN CLAYEY SILT W/ DECOMPOSED ROCK & ROOTS		2"S	4-A	121	42	85	3420	—		2/.5' 4/.5'
(MH)	STIFF, RED & GRAY CLAYEY SILT	5	2"SS	4-B	—	38	—	—	—		
(MH)	STIFF, RED, TAN & GRAY CLAYEY SILT	10	2"S	4-C	107	52	70	4410	—		2/.5' 5/.5'
	END OF BORING @ 11'										

* ELEVATION ESTIMATED FROM GRADING PLAN DATED FEB. 4, 1972

AIEA LANI ESTATES

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Boring Log

PROJECT AIEA LANI ESTATES

LOCATION Aiea Heights, Ewa, Oahu, Hawaii

Tax Map Key: 9-9-07: 1

HAMMER:
Weight 140#
Drop 30"

SAMPLER: 2" S. 2" O.D. THIN WALL TUBE
2" SS. 2" STANDARD SPLIT SPOON

BORING NO. 5 Sheet No. ____ of ____

Driller W. LUM ASSOC., INC. Date APR. 25, 1972

Field Party GLORY, RADOVICH

Type of Boring AUGER (ACKER ACE) Diam. 3"

Elev. 829' ± * Datum —

Drill Bit CLAY

Water Level	NOT NOTICED				
Time	—				
Date	4-25-72				

Unified Soil Classification	DESCRIPTION	Depth (Ft.)	Sampler	Sample No.	Wet Dens. P.C.F.	Water Cont. %	Dry Dens. P.C.F.	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test N (Blows per foot) 0 10 20 30 40	PENETRATION DATA: 2" O.D. THIN WALL TUBE SAMPLER BLOWS/0.5'
	ELEV. = 829' ± *	0									
(MH)	BROWN CLAYEY SILT W/ ROOTS		2"S	S-A	92	40 49	—	2250	—		1.5' 2.5' 3.5'
(MH)	STIFF, RED CLAYEY SILT & DECOMPOSED ROCK	5	2"SS	S-B	—	53	—	—	—		
(MH)	STIFF, MOTTLED RED & GRAY CLAYEY SILT W/ TRACES OF ROOTS	10	2"S	S-C	97	63 57	—	2950	—		2.5' 5.5'
(MH)	STIFF, MOTTLED BROWN & GRAY CLAYEY SILT	15	2"SS	S-D	—	62	—	—	—		
	END OF BORING @ 16.5'										

* ELEVATION ESTIMATED FROM GRADING PLAN DATED FEB. 4, 1972

AIEA LANI ESTATE

WALTER LUM ASSOCIATES, INC. 3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log

PROJECT: AIEA LANI ESTATES
LOCATION: Aiea Heights, Ewa, Oahu, Hawaii
Tax Map Key: 9-9-07: 1

HAMMER:
Weight: 140#
Drop: 30"
SAMPLER: 2" SS. 2" O.D. THIN WALL TUBE
2" SS. 2" STANDARD SPLIT SPOON

BORING NO. G Sheet No. ____ of ____
Driller W. LUM ASSOC., INC. Date APR. 25, 1972
Field Party GLORY, RADOVICH
Type of Boring AUGER (ACKER ACE) Diam. 3"
Elev. 828'± * Datum —
Drill Bit CLAY

Water Level				
Time	—			
Date	4-25-72			

Unified Soil Classification	DESCRIPTION	Depth (Ft.)	Sampler	Sample No.	Wet Dens. P.C.F.	Water Cont. %	Dry Dens. P.C.F.	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test N (Blows per foot) 0 10 20 30 40	PENETRATION DATA: 2" O.D. THIN WALL TUBE SAMPLER BLOWS/0.5'
	ELEV. = 828'± *	0									
(MH)	STIFF, REDDISH BROWN CLAYEY SILT & DECOMPOSED ROCK		2"S	G-A	102	62 36	—	—	—		3/.5' 10/.5'
MH	STIFF, MOTTLED BROWN CLAYEY SILT W/TRACES OF DECOMPOSED ROCK	5	2"SS	G-B	—	44 LL= PL=	— 63 49	—	—		
(MH)	STIFF, MOTTLED RED & GRAY CLAYEY SILT	10	2"S	G-C	97	52	64	7910	—		3/.5' 5/.5'
(MH)	STIFF, MOTTLED GRAY & PURPLE CLAYEY SILT	15	2"SS	G-D	—	65 62	—	—	—		
(MH)	STIFF, MOTTLED GRAY CLAYEY SILT	20	2"S	G-E	—	61 65	—	—	—		2/.5' 3/.5' 3/.5'
(MH)	STIFF, MOTTLED DARK GRAY & RED CLAYEY SILT										
	END OF BORING @ 21.5'										

* ELEVATION ESTIMATED FROM GRADING PLAN DATED FEB. 4, 1972

AIEA LANI ESTATES

WALTER LUM ASSOCIATES, INC. 3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log

PROJECT: AIEA LANI ESTATES
LOCATION: Aiea Heights, Ewa, Oahu, Hawaii
Tax Map Key: 9-9-07: 1

HAMMER:
Weight: 140#
Drop: 30"
SAMPLER: 2" S.2" O.D. THIN WALL TUBE
2"SS-2" STANDARD SPLIT SPOON

BORING NO. 7 Sheet No. ____ of ____
Driller W.LUM ASSOC., INC. Date APR. 18,
Field Party GLORY, TSUKAZAKI, RADOVICH
Type of Boring AUGER (MOBILE MINUTEMAN) Diam. 3"
Elev. 804' ± * Datum —
Drill Bit CLAY

Water Level	NOT NOTICED				
Time	—				
Date	4-18-72				

Unified Soil Classification	DESCRIPTION	Depth (Ft.)	Sampler	Sample No.	Wet Dens. P.C.F.	Water Cont. %	Dry Dens. P.C.F.	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test N (Blows per foot) 0 10 20 30 40	PENETRATION DATA: 2" O.D. THIN WALL TUBE SAMPLER BLOWS/0.5'
	ELEV. = 804' ± *	0									
(MH)	STIFF, DARK REDDISH BROWN CLAYEY SILT W/ ROOTS		2"S	T-A	103	45	71	9940	—		3/5' 4/5'
(MH)	STIFF, RED CLAYEY SILT	5	2"SS	T-B	—	37	—	—	—	5/.5'	13/.5'
(MH)	STIFF, REDDISH BROWN CLAYEY SILT W/ GRAY CLAY STREAKS	10	2"S	T-C	123	35	91	9330	—		12/.5'
	END OF BORING @ 10.5'					LL= 88 PL= 51					

* ELEVATION ESTIMATED FROM GRADING PLAN DATED FEB. 4, 1972

AIEA LANI ESTATES

WALTER LUM ASSOCIATES, INC. 3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log

PROJECT: AIEA LANI ESTATES

LOCATION: Aiea Heights, Ewa, Oahu, Hawaii
Tax Map Key: 9-9-07: 1

HAMMER:
Weight: 140#
Drop: 30"

SAMPLER: 2" SS.2" O.D. THIN WALL TUBE
2" SS.2" STANDARD SPLIT SPOON

BORING NO. 8 Sheet No. ____ of ____

Driller: W. LUM ASSOC., INC. Date: APR. 21, 1972

Field Party: GLORY, RADOVICH

Type of Boring: AUGER (ACKER ACE) Diam.: 3"

Elev.: 811'± * Datum: —

Drill Bit: CLAY

Water Level				
NOT NOTICED				
Time —				
Date 4.21.72				

Unified Soil Classification	DESCRIPTION ELEV.: 811'± *	Depth (Ft.)	Sampler	Sample No.	Wet Dens. P.C.F.	Water Cont. %	Dry Dens. P.C.F.	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test N (Blows per foot) 0 10 20 30 40	PENETRATION DATA: 2" O.D. THIN WALL TUBE SAMPLER BLOWS/0.5'
(MH)	STIFF, BROWN CLAYEY SILT W/ROOTS	0	2"S	S-A	107	32 47	—	8390	—		3/.5' 7/.5'
(MH)	STIFF, RED CLAYEY SILT W/ROOTS										
(MH)	STIFF, MOTTLED BROWN, GRAY & RED CLAYEY SILT	5	2"SS	S-B	—	54	—	—	—		
(MH)	STIFF, RED & DARK GRAY CLAYEY SILT	10	2"S	S-C	118	50 44	—	10030	—		6/.5' 10/.5'
	END OF BORING @ 11'										

* ELEVATION ESTIMATED FROM GRADING PLAN DATED FEB. 4, 1972

AIEA LANI ESTATES

WALTER LUM ASSOCIATES, INC. 3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log

PROJECT: AIEA LANI ESTATES

LOCATION: Aiea Heights, Ewa, Oahu, Hawaii
Tax Map Key: 9-9-07: 1

HAMMER: Weight 140# Drop 30"

SAMPLER: 2" S. 2" O.D. THIN WALL TUBE
2" SS. 2" STANDARD SPLIT SPOON

BORING NO. 9 Sheet No. ____ of ____

Driller W.LUM ASSOC., INC. Date APR. 26, 1972

Field Party GLORY, RADOVICH

Type of Boring AUGER (ACKER ACE) Diam. 3"

Elev. 825' ± * Datum —

Drill Bit CLAY

Water Level NOT NOTICED

Time —

Date 4-26-72

Unified Soil Classification	DESCRIPTION	Depth (Ft.)	Sampler	Sample No.	Wet Dens. P.C.F.	Water Cont. %	Dry Dens. P.C.F.	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	Standard Penetration Test N (Blows per foot) 0 10 20 30 40	2" O.D. THIN WALL TUBE SAMPLER BLOWS/0.5'
	ELEV. = 825' ± 7 *	0									
(MH)	STIFF, DARK REDDISH BROWN CLAYEY SILT W/ROOTS		2"S	9-A	95	36 53	—	3230	—		4/5' 5/5'
(MH)	REDDISH BROWN CLAYEY SILT W/ROOTS	5									
(MH)	MOTTLED BROWN & GRAY CLAYEY SILT		2"SS	9-B	—	41	—	—	—		
(MH)	MOTTLED BROWN CLAYEY SILT W/ DECOMPOSED ROCK	10	2"S	9-C	108	34	80	—	—		7/5' 7/2'
	END OF BORING @ 10.1'										

* ELEVATION ESTIMATED FROM GRADING PLAN DATED FEB. 4, 1972

AIEA LANI ESTATES

WALTER LUM ASSOCIATES, INC. 3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log

PROJECT: AIEA LANI ESTATES
LOCATION: Aiea Heights, Ewa, Oahu, Hawaii
Tax Map Key: 9-9-07: 1

HAMMER:
Weight: 140#
Drop: 30"
SAMPLER: 2" SS. 2" O.D. THIN WALL TUBE
2" SS. 2" STANDARD SPLIT SPOON

BORING NO. 10 Sheet No. ____ of ____
Driller: W. LUM ASSOC., INC. Date: APR. 24, 1972
Field Party: GLORY, KAKU, RADOVICH
Type of Boring: AUGER (ACKER ACE) Diam.: 3"
Elev.: 823'± * Datum: —
Drill Bit: FINGER TYPE
Water Level: NOT NOTICED
Time: —
Date: 4-24-72

Unified Soil Classification	DESCRIPTION	Depth (Ft.)	Sampler	Sample No.	Wet Dens. P.C.F.	Water Cont. %	Dry Dens. P.C.F.	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test N (Blows per foot) 0 10 20 30 40	PENETRATION DATA: 2" O.D. THIN WALL TUBE SAMPLER BLOWS/0.5'
	ELEV. = 823'± *	0									
(MH)	STIFF, REDDISH BROWN CLAYEY SILT W/ ROOTS		2"S	10-A	107	42	76	—	2000		3/5' 6/5'
(MH)	STIFF, MOTTLED BROWN W/GRAY CLAYEY SILT W/ DECOMPOSED ROCK	5	2"SS	10-B	—	44	—	—	—		
(MH)	MOTTLED BROWN DECOMPOSED ROCK (CRUSHES TO CLAYEY SILT)	10	2"S	10-C	115	45 39	—	11,390	—		5/5' 10/5'
(MH)	STIFF, MOTTLED RED & DARK GRAY CLAYEY SILT	15	2"SS	10-D	—	58	—	—	—		
	END OF BORING @ 16.5'										

* ELEVATION ESTIMATED FROM GRADING PLAN DATED FEB. 4, 1972

AIEA LANI ESTATES

WALTER LUM ASSOCIATES, INC. 3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log

PROJECT: AIEA LANI ESTATES

LOCATION: Aiea Heights, Ewa, Oahu, Hawaii
Tax Map Key: 9-9-07: 1

HAMMER:
Weight: 140#
Drop: 30"

SAMPLER: 2"SS-2" STANDARD SPLIT SPOON
2"S-2" O.D. THIN WALL TUBE

BORING NO. 11 Sheet No. ____ of ____

Driller: W. LUM ASSOC., INC. Date: APR. 26, 1972

Field Party: MAKAULA, KAKU

Type of Boring: AUGER (MOBILE MINUTEMAN) Diam.: 3"

Elev.: 820'± * Datum: —

Drill Bit: FINGER TYPE

Water Level	NOT NOTICED				
Time	—				
Date	4-26-72				

Unified Soil Classification	DESCRIPTION	Depth (Ft.)	Sampler	Sample No.	Wet Dens. P.C.F.	Water Cont. %	Dry Dens. P.C.F.	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test N (Blows per foot) 0 10 20 30 40	PENETRATION DATA: 2" O.D. THIN WALL TUBE SAMPLER BLOWS/0.5'
	ELEV. = 820'± *	0									
(MH)	STIFF, BROWN CLAYEY SILT W/ROOTS		2"S	11-A	110	38	79	5120	—		4/5" 4/5"
(MH)	STIFF, MOTTLED RED, TAN & GRAY CLAYEY SILT	5	2"SS	11-B	—	58	—	—	—		
(MH)	MEDIUM, MOTTLED BROWN CLAYEY SILT W/ DECOMPOSED ROCK	10									
(MH)	MEDIUM, RED & DARK GRAY CLAYEY SILT		2"S	11-C	—	59 59 58	—	—	—		2/5" 2/5" 3/5"
	END OF BORING 11.5'										
	* ELEVATION ESTIMATED FROM GRADING PLAN DATED FEB. 4, 1972										

AIEA LANI ESTATE

WALTER LUM ASSOCIATES, INC. 3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log

PROJECT: AIEA LANI ESTATES
LOCATION: Aiea Heights, Ewa, Oahu, Hawaii
Tax Map Key: 9-9-07: 1

HAMMER:
Weight: 140#
Drop: 30"
SAMPLER: 2" S. 2" O.D. THIN WALL TUBE
2" SS. 2" STANDARD SPLIT SPOON

BORING NO. 12 Sheet No. ____ of ____
Driller: W. LUM ASSOC., INC. Date: APR. 25, 1972
Field Party: MAKAULA, KAKU
Type of Boring: AUGER (MOBILE MINUTEMAN) Diam.: 3"
Elev.: 821'± * Datum: —
Drill Bit: FINGER TYPE

Water Level	NOT NOTICED			
Time	—			
Date	4-25-72			

Unified Soil Classification	DESCRIPTION	Depth (Ft.)	Sampler	Sample No.	Wet Dens. P.C.F.	Water Cont. %	Dry Dens. P.C.F.	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test N (Blows per foot) 0 10 20 30 40	PENETRATION DATA: 2" O.D. THIN WALL TUBE SAMPLER BLOWS/0.5'
	ELEV.: 821'± *	0									
(MH)	SOFT, REDDISH BROWN CLAYEY SILT W/ ROOTS		2"S	12-A	91	58	51	1500	—		2/.5' 1/.5'
		5	2"SS	12-B	—	55	—	—	—		
(MH)	STIFF, MOTTLED TAN BROWN CLAYEY SILT										
		10	2"S	12-C	107	58 59	—	2810	—		2/.5' 5/.5' 5/.5'
(MH)	MEDIUM, MOTTLED GRAY & BROWN CLAYEY SILT										
		15	2"SS	12-D	—	62 51	—	—	—	2 BLOWS/.5' 4/.5'	
(MH)	BROWN CLAYEY SILT										
	END OF BORING @ 16.5'										

* ELEVATION ESTIMATED FROM GRADING PLAN DATED FEB. 4, 1972

AIEA LANI ESTATES

WALTER LUM ASSOCIATES, INC. 3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log

PROJECT: AIEA LANI ESTATES

LOCATION: Aiea Heights, Ewa, Oahu, Hawaii

Tax Map Key: 9-9-07: 1

HAMMER:
Weight: 140#
Drop: 30"

SAMPLER: 2" S.S. 2" O.D. THIN WALL TUBE
2" SS. 2" STANDARD SPLIT SPOON

BORING NO. 13 Sheet No. ____ of ____

Driller: W. LUM ASSOC., INC. Date: APR. 25, 1972

Field Party: MAKAULA, KAKU

Type of Boring: AUGER (MOBILE MINUTEMAN) Diam.: 3"

Elev.: 820'± * Datum: —

Drill Bit: FINGER TYPE

Water Level					
Time	—				
Date	4-25-72				

Unified Soil Classification	DESCRIPTION	Depth (Ft.)	Sampler	Sample No.	Wet Dens. P.C.F.	Water Cont. %	Dry Dens. P.C.F.	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test N (Blows per foot) 0 10 20 30 40	PENETRATION DATA: 2" O.D. THIN WALL TUBE SAMPLER BLOWS/0.5'
	ELEV. = 820'±; *	0									
(MH)	MEDIUM, REDDISH BROWN CLAYEY SILT W/ROOTS		2"S	13-A	108	55	81	6560	—		3/.5' 4/.5'
(MH)	STIFF, MOTTLED BROWN & GRAY, CLAYEY SILT	5	2"SS	13-B	—	47	—	—	—		
(MH)	MEDIUM MOTTLED BROWN CLAYEY SILT	10	2"S	13-C	95	54	62	—	—		2/.5' 2/.5' 4/.5'
(MH)	MEDIUM, MOTTLED BROWN RED & GRAY CLAYEY SILT	15	2"SS	13-D	—	64	—	—	—		
	END OF BORING @ 16.5'										

* ELEVATION ESTIMATED FROM GRADING PLAN DATED FEB. 4, 1972

AIEA LANI ESTATES

WALTER LUM ASSOCIATES, INC. 3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log

PROJECT: AIEA LANI ESTATES

LOCATION: Aiea Heights, Ewa, Oahu, Hawaii

Tax Map Key: 9-9-07: 1

HAMMER:
Weight: 140#
Drop: 30"

SAMPLER: 2" S.2"O.D. THIN WALL TUBE
2" SS.2" STANDARD SPLIT SPOON

BORING NO. 14 Sheet No. ____ of ____

Driller: W. LUM ASSOC., INC. Date: APR. 24, 1972

Field Party: GLORY, KAKU, RADOVICH

Type of Boring: AUGER (ACKER ACE) Diam.: 3"

Elev.: 840' ± * Datum: —

Drill Bit: CLAY

Water Level: NOT NOTICED
Time: —
Date: 4-24-72

Unified Soil Classification	DESCRIPTION	Depth (Ft.)	Sampler	Sample No.	Wet Dens. P.C.F.	Water Cont. %	Dry Dens. P.C.F.	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test N (Blows per foot) 0 10 20 30 40	PENETRATION DATA: 2" O.D. THIN WALL TUBE SAMPLER BLOWS/0.5'
	ELEV. = 840' ± *	0									
(MH)	SOFT, REDDISH BROWN CLAYEY SILT		2"S	14-A	78	45	54	3660	—		1/.5' 1/.5'
MH	STIFF, MOTTLED BROWN CLAYEY SILT	5	2"SS	14-B	—	48 LL= 84 PL= 53	—	—	—		
(MH)	STIFF, MOTTLED RED & GRAY CLAYEY SILT	10	2"S	14-C	108	53	70	8950	—		2/.5' 6/.5' 10/.5'
(MH)	STIFF, MOTTLED BROWN & GRAY, CLAYEY SILT	15	2"SS	14-D	—	58	—	—	—		
	END OF BORING @ 16.5'										

* ELEVATION ESTIMATED FROM GRADING PLAN DATED FEB. 4, 1972

AIEA LANI ESTATES

WALTER LUM ASSOCIATES, INC. 3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log

PROJECT: AIEA LANI ESTATES

LOCATION: Aiea Heights, Ewa, Oahu, Hawaii
Tax Map Key: 9-9-07: 1

HAMMER:
Weight: 140#
Drop: 30"
SAMPLER: 2" S.S. 2" O.D. THIN WALL TUBE
2" SS. 2" STANDARD SPLIT SPOON

BORING NO. 15 Sheet No. ____ of ____
Driller W. LUM ASSOC., INC. Date APR. 20, 1972
Field Party GLORY, TSUKAZAKI, RADOVICH
Type of Boring AUGER (MOBILE MINUTEMAN) Diam. 3"
Elev. 795'± * Datum —
Drill Bit CLAY
Water Level NOT NOTICED
Time —
Date 4-20-72

Unified Soil Classification	DESCRIPTION	Depth (Ft.)	Sampler	Sample No.	Wet Dens. P.C.F.	Water Cont. %	Dry Dens. P.C.F.	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test N (Blows per foot) 0 10 20 30 40	PENETRATION DATA: 2" O.D. THIN WALL TUBE SAMPLER BLOWS/0.5'
	ELEV.= 795'± *	0									
(MH)	MEDIUM BROWN CLAYEY SILT W/ ROOTS		2"S	15-A	107	40	76	12330	—		2/5' 3/5'
(MH)	MEDIUM MOTTLED REDDISH BROWN CLAYEY SILT W/ TRACES OF DECOMPOSED ROCK	5	2"SS	15-B	—	40 39	—	—	—		
MH	STIFF, RED CLAYEY SILT W/ GRAY CLAY STREAKS	10	2"SS	15-C	118	35 LL= 96 PL= 50	87	21610	—		3/5' 9/5'
	END OF BORING @ 11'										

* ELEVATION ESTIMATED FROM GRADING PLAN DATED FEB. 4, 1972

AIEA LANI ESTATES

WALTER LUM ASSOCIATES, INC. 3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log

PROJECT: AIEA LANI ESTATES
LOCATION: Aiea Heights, Ewa, Oahu, Hawaii
Tax Map Key: 9-9-07: 1

HAMMER:
Weight: 140#
Drop: 30"
SAMPLER: 2" S. 2" O.D. THIN WALL TUBE
2" SS. 2" STANDARD SPLIT SPOON

BORING NO. 16 Sheet No. ____ of ____
Driller: W. LUM ASSOC., INC. Date: APR. 21, 1972
Field Party: GLORY, RADOVICH
Type of Boring: AUGER (ACKER ACE) Diam.: 3"
Elev.: 798'± * Datum: —
Drill Bit: CLAY

Water Level					
Time	—				
Date	4-21-72				

Unified Soil Classification	DESCRIPTION	Depth (Ft.)	Sampler	Sample No.	Wet Dens. P.C.F.	Water Cont. %	Dry Dens. P.C.F.	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test N (Blows per foot) 0 10 20 30 40	PENETRATION DATA: 2" O.D. THIN WALL TUBE SAMPLER BLOWS/0.5'
	ELEV. = 798'± *	0									
(MH)	STIFF, BROWN CLAYEY SILT W/ROOTS		2"S	16-A	115	39	83	9140	—		4/5' 6/5'
(MH)	STIFF, REDDISH BROWN CLAYEY SILT W/ROOTS										
MH	STIFF, TAN BROWN CLAYEY SILT	5	2"SS	16-B	—	37	—	—	—		
						LL= 60					
						PL= 38					
(MH)	STIFF, MOTTLED BROWN & LIGHT GRAY CLAYEY SILT	10	2"S	16-C	115	52	76	8200	—		4/5' 8/5'
(MH)	STIFF, MOTTLED RED & GRAY CLAYEY SILT	15	2"SS	16-D	—	65	—	—	—		
	END OF BORING @ 16.5'										

* ELEVATION ESTIMATED FROM GRADING PLAN DATED FEB. 4, 1972

AIEA LANI ESTATES

WALTER LUM ASSOCIATES, INC. 3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log

PROJECT: AIEA LANI ESTATES
LOCATION: Aiea Heights, Ewa, Oahu, Hawaii
Tax Map Key: 9-9-07: 1

HAMMER:
Weight: 140#
Drop: 30"
SAMPLER: 2"SS-2"O.D. THIN WALL TUBE
2"SS-2" STANDARD SPLIT SPOON

BORING NO. 17 Sheet No. ____ of ____
Driller W. LUM ASSOC., INC. Date APR. 18 & 19, 1972
Field Party GLORY, RADOVICH, TSUKAZAKI
Type of Boring AUGER (MOBILE MINUTEMAN) Diam. 3"
Elev. 784'± * Datum —
Drill Bit CLAY
Water Level NOT NOTICED
Time —
Date 4-18-72

Unified Soil Classification	DESCRIPTION	Depth (Ft.)	Sampler	Sample No.	Wet Dens. P.C.F.	Water Cont. %	Dry Dens. P.C.F.	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	Standard Penetration Test N (Blows per foot) 0 10 20 30 40	2"O.D. THIN WALL TUBE SAMPLER BLOWS/0.5'
	ELEV. = 784'± *	0									
MH	STIFF, REDDISH BROWN CLAYEY SILT		2"S	17-A	108	39	78	11340	—		3/.5' 6/.5'
						LL= 90					
						PL= 59					
		5				50				6/.5'	
			2"SS	17-B	—	51	—	—	—	12/.5'	
(MH)	STIFF, MOTTLED RED & GRAY CLAYEY SILT										
		10									
			2"S	17-C	108	55	69	4130	—		3/.5' 5/.5'
(MH)	STIFF, MOTTLED GRAY & RED CLAYEY SILT										
		15									
			2"SS	17-D	—	61	—	—	—		
	END OF BORING @ 16.5'										

* ELEVATION ESTIMATED FROM GRADING PLAN DATED FEB. 4, 1972

AIEA LANI ESTATES

WALTER LUM ASSOCIATES, INC. 3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log

PROJECT: AIEA LANI ESTATES
LOCATION: Aiea Heights, Ewa, Oahu, Hawaii
Tax Map Key: 9-9-07: 1

HAMMER: Weight 140# Drop 30"
SAMPLER: 2" S. 2" O.D. THIN WALL TUBE 2" SS. 2" STANDARD SPLIT SPOON

BORING NO. 18 Sheet No. ____ of ____
Driller W. LUM ASSOC., INC. Date APR. 21, 1972
Field Party GLORY, RADOVICH
Type of Boring AUGER (ACKER ACE) Diam. 3"
Elev. 783'± * Datum —
Drill Bit CLAY

Water Level					
Time	—				
Date	4-21-72				

Unified Soil Classification	DESCRIPTION	Depth (Ft.)	Sampler	Sample No.	Wet Dens. P.C.F.	Water Cont. %	Dry Dens. P.C.F.	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test N (Blows per foot) 0 10 20 30 40	PENETRATION DATA: 2" O.D. THIN WALL TUBE SAMPLER BLOWS/0.5'
	ELEV. = 783'± *	0									
	SOFT, REDDISH BROWN CLAYEY SILT W/ROOTS		2"S	18-A	111	49	74	1830	—		3/.5' 6/.5'
(MH)	STIFF, REDDISH BROWN CLAYEY SILT W/ROOTS	5				52					
			2"SS	18-B	—	45	—	—	—		
(MH)	STIFF, MOTTLED RED CLAYEY SILT										
	STIFF MOTTLED RED & GRAY	10									
(MH)	CLAYEY SILT		2"S	18-C	111	52	73	4210	—		3/.5' 3/.5' 5/.5'
	END OF BORING @ 11.5'										

* ELEVATION ESTIMATED FROM GRADING PLAN DATED FEB. 4, 1972

AIEA LANI ESTATES

WALTER LUM ASSOCIATES, INC. 3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log

PROJECT: AIEA LANI ESTATES
LOCATION: Aiea Heights, Ewa, Oahu, Hawaii
Tax Map Key: 9-9-07: 1

HAMMER:
Weight: 10 # SLEDGE HAMMER
Drop:
SAMPLER: 2" O.D. THIN WALL TUBE

BORING NO. 19 Sheet No. ____ of ____
Driller W. LUM ASSOC., INC. Date APR. 28, 1972
Field Party GLORY, RADOVICH
Type of Boring AUGER (MOBILE MINUTEMAN) Diam. 3"
Elev. 804' ± * Datum —
Drill Bit CLAY

Water Level				
Time	—			
Date	4-28-72			

Unified Soil Classification	DESCRIPTION	Depth (Ft.)	Sample No.	Wet Dens. P.C.F.	Water Cont. %	Dry Dens. P.C.F.	Unconf. Comp. P.S.F.	Vane Sheer P.S.F.	PENETRATION DATA: Standard Penetration Test N (Blows per foot) 0 10 20 30 40	PENETRATION DATA: 10# SLEDGE HAMMER BLOWS/0.5'
	ELEV.= 804'± *	0								
(MH)	STIFF, REDDISH BROWN CLAYEY SILT		19-A	99	42	70	17340	—		13/.5' 17/.5'
(MH)	STIFF, MOTTLED BROWN CLAYEY SILT W/ DECOMPOSED ROCK	5	19-B	114	31	83	—	—		18/.5'
(MH)	GRAY & REDDISH BROWN DECOMPOSED ROCK (SOME CRUSHES TO CLAYEY SILT)	10	19-C	119	35	88	3980	—		21/.5'
(MH)	STIFF, RED & PURPLE CLAYEY SILT	15	19-D	103	66	62	3330	—		13/.5' 14/.5'
	END OF BORING @ 16'									

* ELEVATION ESTIMATED FROM GRADING PLAN DATED FEB. 4, 1972

AIEA LANI ESTS 35

WALTER LUM ASSOCIATES, INC. 3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log

PROJECT AIEA LANI ESTATES

LOCATION Aiea Heights, Ewa, Oahu, Hawaii

Tax Map Key: 9-9-07: 1

HAMMER:

Weight

Drop

SAMPLER:

LOG OF SLOPE ~~BORING~~ NO. 19A Sheet No. ____ of ____

Driller W. LUM ASSOC., INC. Date APR. 18, 1972

Field Party GLORY, TSUKAZAKI, RADOVICH

Type of Boring 780'± * Diam. —

Elev. ____ Datum ____

Drill Bit —

Water Level	NO SEEPAGE NOTICED			
Time	—			
Date	4-18-72			

Unified Soil Classification	DESCRIPTION	Depth (Ft.)	Sampler	Sample No.	Wet Dens. P.C.F.	Water Cont. %	Dry Dens. P.C.F.	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test, N (Blows per foot) 0 10 20 30 40
	ELEV. = 780'± ✓ *	0								
	BROWN, CLAYEY SILT									
	REDDISH BROWN CLAYEY SILT	5								
	MOTTLED REDDISH BROWN & TAN, DECOMPOSED ROCK & CLAYEY SILT	10								
	MOTTLED REDDISH BROWN & BLUE GRAY DECOMPOSED ROCK & CLAYEY SILT	15								
		20								
		25								
	MOTTLED REDDISH BROWN TAN & GRAY DECOMPOSED ROCK W/ COBBLES OR BOULDERS	30								
		35								
	MOTTLED REDDISH BROWN & GRAY W/ WHITE DECOMPOSED ROCK W/ COBBLES OR BOULDERS	40								
		45								
	A.C. ROAD									
	BOTTOM OF SLOPE @ 47½									
	* ELEVATION ESTIMATED FROM GRADING PLAN DATED FEB. 4, 1972									

AIEA LANI ESTATES

WALTER LUM ASSOCIATES, INC. 3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log

PROJECT: AIEA LANI ESTATES
LOCATION: Aiea Heights, Ewa, Oahu, Hawaii
Tax Map Key: 9-9-07: 1

HAMMER:
Weight: 140#
Drop: 30"
SAMPLER: 2" S. 2" O.D. THIN WALL TUBE
2" SS. 2" STANDARD SPLIT SPOON

BORING NO. 20 Sheet No. ____ of ____
Driller: W. LUM ASSOC., INC. Date: APRIL 26, 1972
Field Party: MAKAULA, KAKU, GLORY, RADOVICH
Type of Boring: AUGER (MOBILE MINUTEMAN) Diam.: 3"
Elev.: 794' ± * Datum: —
Drill Bit: FINGER TYPE
Water Level: NOT NOTICED
Time: —
Date: 4-26-72

Unified Soil Classification	DESCRIPTION	Depth (Ft.)	Sampler	Sample No.	Plastic Limit	Water Cont. %	Liquid Limit	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test, N (Blows per foot) 0 10 20 30 40	PENETRATION DATA: 2" O.D. THIN WALL TUBE SAMPLER, BLOWS/0.5'
	ELEV. = 794' ± *	0									
MH	STIFF, BROWN CLAYEY SILT W/ ROOTS		2"S	20-A	102	40 LL= 69 PL= 45	73	7220	—		4/5' 5/5'
		5	2"SS	20-B	—	55	—	—	—		
MH	STIFF, MOTTLED BROWN RED & GRAY CLAYEY SILT										
		10	2"S	20-C	III	60 LL= 118 PL= 52	69	6610	—		3/5' 5/5'
	END OF BORING @ 11'										

* ELEVATION ESTIMATED FROM GRADING PLAN DATED FEB. 4, 1972

AIEA LANI ESTATES

TABLE I A - SUMMARY OF LABORATORY TEST RESULTS

BORING NO.	1	1		2
SAMPLE NO.		C		C
DEPTH BELOW SURFACE	SURFACE	10'-11'		10'-11'
DESCRIPTION	BROWN CLAYEY SILT W/ROOTS	MOTTLED GRAY & RED CLAYEY SILT		MOTTLED GRAY & RED CLAYEY SILT W/TRACES OF DECOMP. ROCK
GRAIN-SIZE ANALYSIS (% Passing)				
Sieve 1"	100			
1/2"	100			
#4	100			
#10	100			
#20	100			
#40	99.9			
#100	99.8			
#200	99.7			
ATTERBERG LIMITS				
Air Dried or Natural	NATURAL	NATURAL		NATURAL
Liquid Limit	69	102		91
Plastic Limit	39	53		56
Plasticity Index	30	49		35
Dilatancy	MED.-QUICK	MEDIUM		MEDIUM
Toughness	SLIGHT-MED.	MEDIUM		MEDIUM
Dry Strength	SLIGHT-MED	SLIGHT-MED.		MEDIUM
UNIFIED SOIL CLASSIFICATION	MH	MH		MH
APPARENT SPECIFIC GRAVITY	3.14			
EXPANSION AND CBR TESTS (Surcharge-51 P.S.F.)				
Molding Moisture, %	31.9			
Molding Dry Density, P.C.F.	93.0			
Swell upon saturation, %	0.7			
CBR at 0.1" Penetration	7.3			
MOISTURE-DENSITY RELATIONS OF SOILS (AASHO T-180-57 Method ___)	A			
Dry to Wet or Wet to Dry	WET TO DRY			
Max. Dry Density (P.C.F.)	91.0			
Optimum Moisture (%)	33.5			

REMARKS:

WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

Date 5-8-72 By BT.

AIEA LANI ESTATES

TABLE I B - SUMMARY OF LABORATORY TEST RESULTS

BORING NO.	4		6	7
SAMPLE NO.			B	C
DEPTH BELOW SURFACE	SURFACE		5'-6.5'	10'-10.5'
DESCRIPTION	BROWN CLAYEY SILT W/ROOTS		MOTTLED BROWN CLAYEY SILT W/TRACES OF DECOMP. ROCK	REDDISH-BROWN CLAYEY SILT W/GRAY CLAY STREAKS
GRAIN-SIZE ANALYSIS (% Passing) Sieve				
1"				
1/2"				
#4				
#10				
#20				
#40				
#100				
#200				
ATTERBERG LIMITS				
Air Dried or Natural	NATURAL		NATURAL	NATURAL
Liquid Limit	69		63	88
Plastic Limit	48		49	51
Plasticity Index	21		14	37
Dilatancy	QUICK		QUICK	MED-QUICK
Toughness	SLIGHT-MED.		SLIGHT-MED.	MEDIUM
Dry Strength	SLIGHT-MED		SLIGHT-MED	MEDIUM
UNIFIED SOIL CLASSIFICATION	MH		MH	MH
APPARENT SPECIFIC GRAVITY				
EXPANSION AND CBR TESTS (Surcharge-51 P.S.F.)				
Molding Moisture, %	40.3			
Molding Dry Density, P.C.F.	81.7			
Swell upon saturation, %	0.3			
CBR at 0.1" Penetration	11.0			
MOISTURE-DENSITY RELATIONS OF SOILS (AASHO T-180-57 Method ___)				
Dry to Wet or Wet to Dry				
Max. Dry Density (P.C.F.)				
Optimum Moisture (%)				

REMARKS:

WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

Date 5-8-72 By PT

AIEA LANI ESTATES

TABLE I C - SUMMARY OF LABORATORY TEST RESULTS

BORING NO.	14	14	15	16
SAMPLE NO.		B	C	B
DEPTH BELOW SURFACE	SURFACE	5'-6.5'	10'-11'	5'-6.5'
DESCRIPTION	REDDISH-BROWN CLAYEY SILT	MOTTLED BROWN CLAYEY SILT	RED CLAYEY SILT W/GRAY CLAY STREAKS	TAN-BROWN CLAYEY SILT
GRAIN-SIZE ANALYSIS (% Passing)				
Sieve 1"				
1/2"				
#4				
#10				
#20				
#40				
#100				
#200				
ATTERBERG LIMITS				
Air Dried or Natural	NATURAL	NATURAL	NATURAL	NATURAL
Liquid Limit	55	84	96	60
Plastic Limit	46	53	45	38
Plasticity Index	9	31	51	22
Dilatancy	QUICK	MED.-QUICK	MEDIUM	MED.-QUICK
Toughness	SLIGHT-MED.	SLIGHT-MED.	MEDIUM	SLIGHT-MED.
Dry Strength	SLIGHT-MED.	SLIGHT-MED.	MEDIUM	SLIGHT-MED.
UNIFIED SOIL CLASSIFICATION	MH	MH	MH	MH
APPARENT SPECIFIC GRAVITY				
EXPANSION AND CBR TESTS (Surcharge-51 P.S.F.)				
Molding Moisture, %	36.1			
Molding Dry Density, P.C.F.	84.3			
Swell upon saturation, %	0.3			
CBR at 0.1" Penetration	26.3			
MOISTURE-DENSITY RELATIONS OF SOILS (AASHO T-180-57 Method)				
Dry to Wet or Wet to Dry				
Max. Dry Density (P.C.F.)				
Optimum Moisture (%)				

REMARKS:

WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

Date 5-8-72 By BT

AIEA LANI ESTATES

TABLE I D - SUMMARY OF LABORATORY TEST RESULTS

BORING NO.	17	18	19	
SAMPLE NO.	B (TOP)			
DEPTH BELOW SURFACE	5'-6.5'	SURFACE	SURFACE	
DESCRIPTION	REDDISH-BROWN CLAYEY SILT	REDDISH-BROWN CLAYEY SILT W/ROOTS	REDDISH-BROWN CLAYEY SILT	
GRAIN-SIZE ANALYSIS (% Passing) Sieve				
1"				
1/2"				
#4				
#10				
#20				
#40				
#100				
#200				
ATTERBERG LIMITS				
Air Dried or Natural	NATURAL	NATURAL	NATURAL	
Liquid Limit	90	76	70	
Plastic Limit	59	47	49	
Plasticity Index	31	29	21	
Dilatancy	MEDIUM	MEDIUM	MEDIUM	
Toughness	MEDIUM	MEDIUM	MEDIUM	
Dry Strength	SLIGHT-MED	SLIGHT-MED.	SLIGHT-MED.	
UNIFIED SOIL CLASSIFICATION	MH	MH	MH	
APPARENT SPECIFIC GRAVITY				
EXPANSION AND CBR TESTS (Surcharge-51 P.S.F.)				
Molding Moisture, %		40.2	38.0	
Molding Dry Density, P.C.F.		81.4	83.9	
Swell upon saturation, %		0.7	0.6	
CBR at 0.1" Penetration		12.2	23.0	
MOISTURE-DENSITY RELATIONS OF SOILS (AASHO T-180-57 Method ___)				
Dry to Wet or Wet to Dry				
Max. Dry Density (P.C.F.)				
Optimum Moisture (%)				

REMARKS:

WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

Date 5-8-72 By BT

AIEA LANI ESTATES

TABLE I-E - SUMMARY OF LABORATORY TEST RESULTS

BORING NO.	20	20		
SAMPLE NO.	A	C		
DEPTH BELOW SURFACE	0.5'-1.5'	10'-11'		
DESCRIPTION	BROWN CLAYEY SILT W/ROOTS	MOTTLED BROWN, RED & GRAY CLAYEY SILT		
GRAIN-SIZE ANALYSIS (% Passing) Sieve				
1"				
1/2"				
#4				
#10				
#20				
#40				
#100				
#200				
ATTERBERG LIMITS				
Air Dried or Natural	NATURAL	NATURAL		
Liquid Limit	69	118		
Plastic Limit	45	52		
Plasticity Index	24	66		
Dilatancy	QUICK	MEDIUM		
Toughness	SLIGHT	MEDIUM		
Dry Strength	SLIGHT-MED.	MEDIUM		
UNIFIED SOIL CLASSIFICATION	MH	MH		
APPARENT SPECIFIC GRAVITY				
EXPANSION AND CBR TESTS (Surcharge-51 P.S.F.)				
Molding Moisture, %				
Molding Dry Density, P.C.F.				
Swell upon saturation, %				
CBR at 0.1" Penetration				
MOISTURE-DENSITY RELATIONS OF SOILS (AASHO T-180-57 Method ___)				
Dry to Wet or Wet to Dry				
Max. Dry Density (P.C.F.)				
Optimum Moisture (%)				

REMARKS:

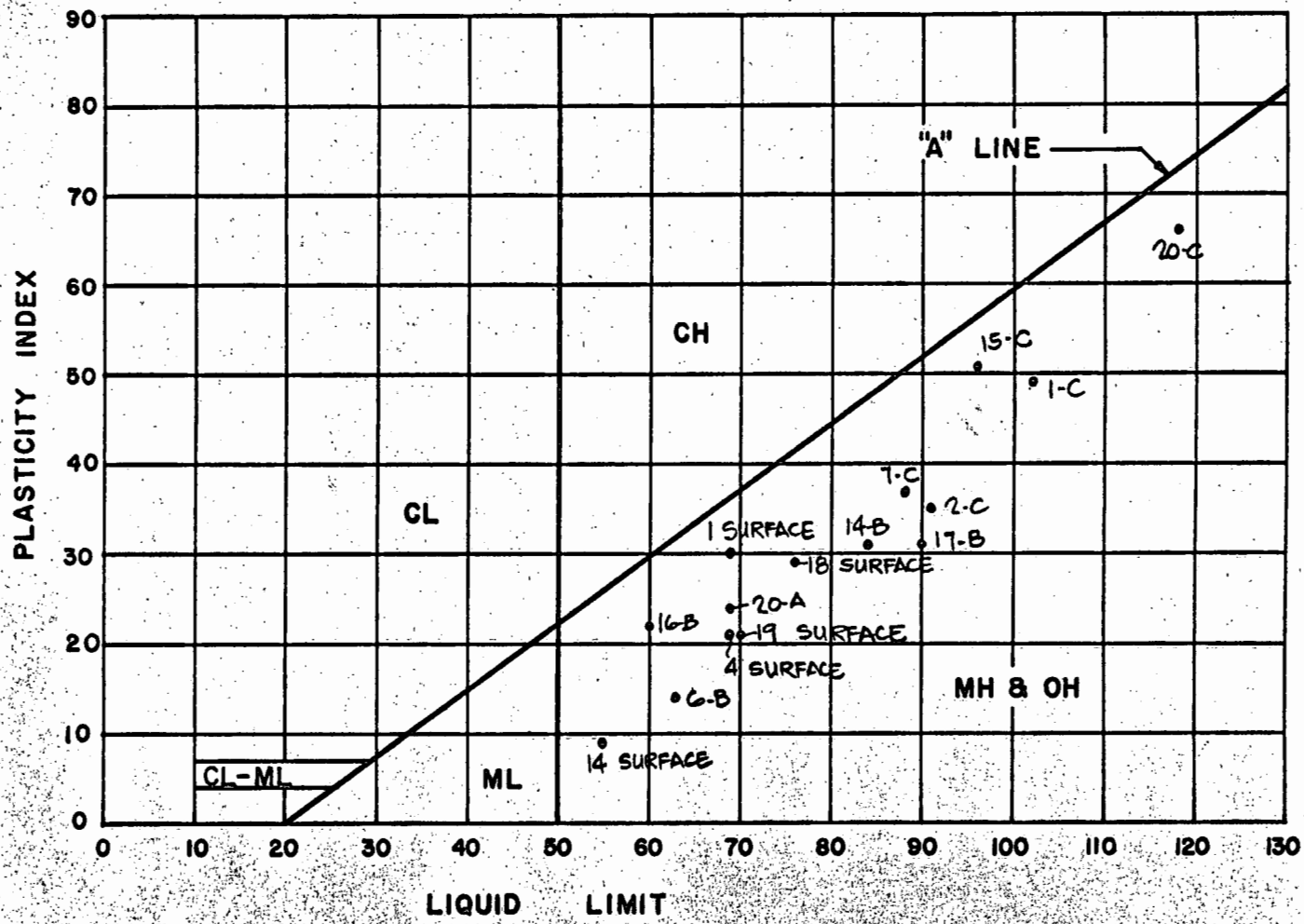
WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

Date 5-8-72 By BJT

PLASTICITY CHART

PROJECT: AIEA LANI ESTATES

LOCATION: AIEA HEIGHTS, EWA, OAHU, HAWAII



DATE 5-8-72 BY RT.

WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

MOISTURE–DENSITY CURVE (AASHO T-180-57, METHOD A)

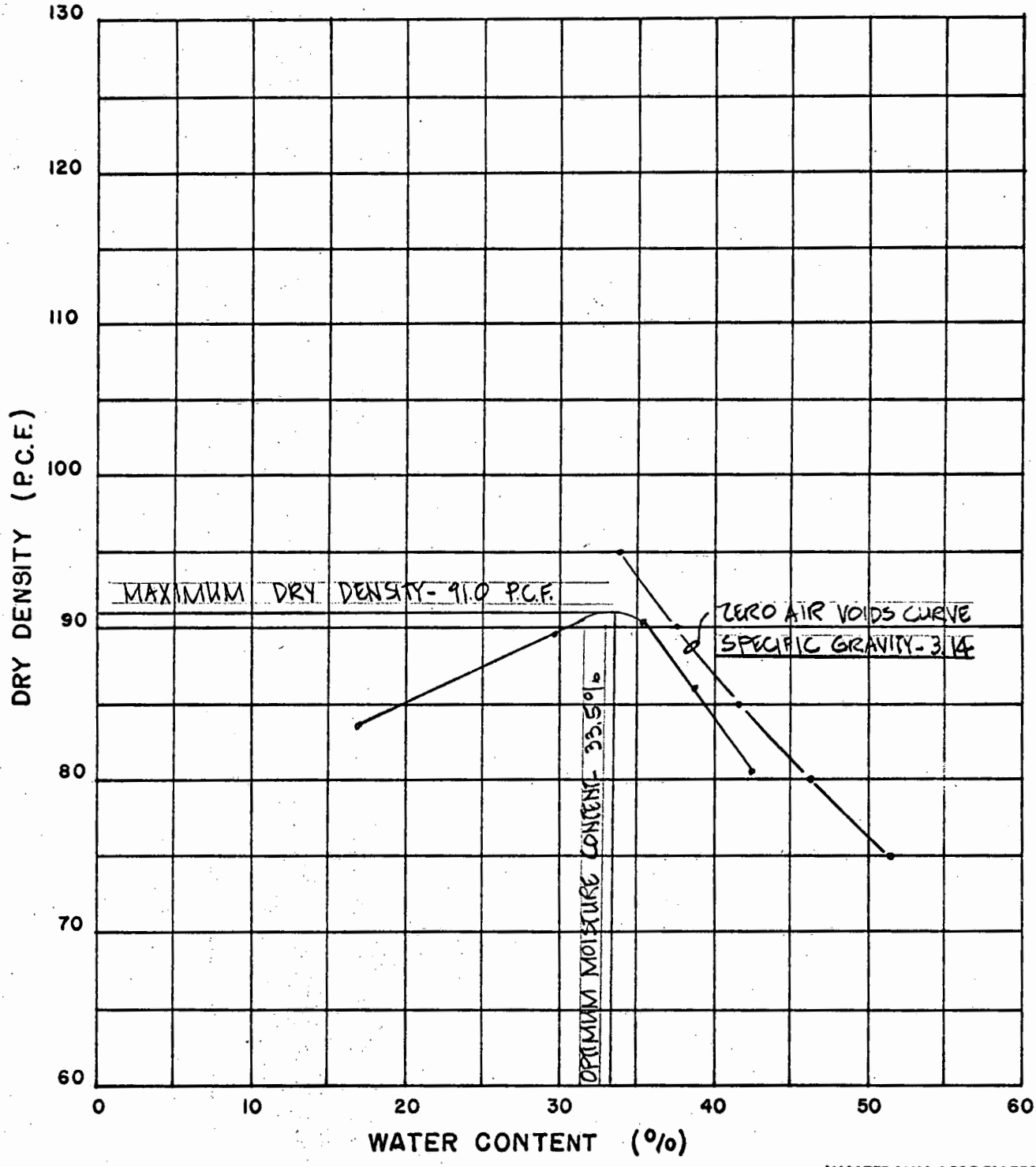
PROJECT: AIEA LANI ESTATES

LOCATION: AIEA HEIGHTS, EWA, OAHU, HAWAII

SAMPLE NO.: 1 SURFACE

SAMPLE DESCRIPTION: BROWN CLAYEY SILT W/ROOTS

AGGREGATE: ¼" MINUS
MOLD SIZE: 4" ϕ 4.59" HIGH
HAMMER: 10 LBS., 18" DROP
LAYERS: 5
BLOWS: 25/LAYER



WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

DATE 4.24.72 BY SK

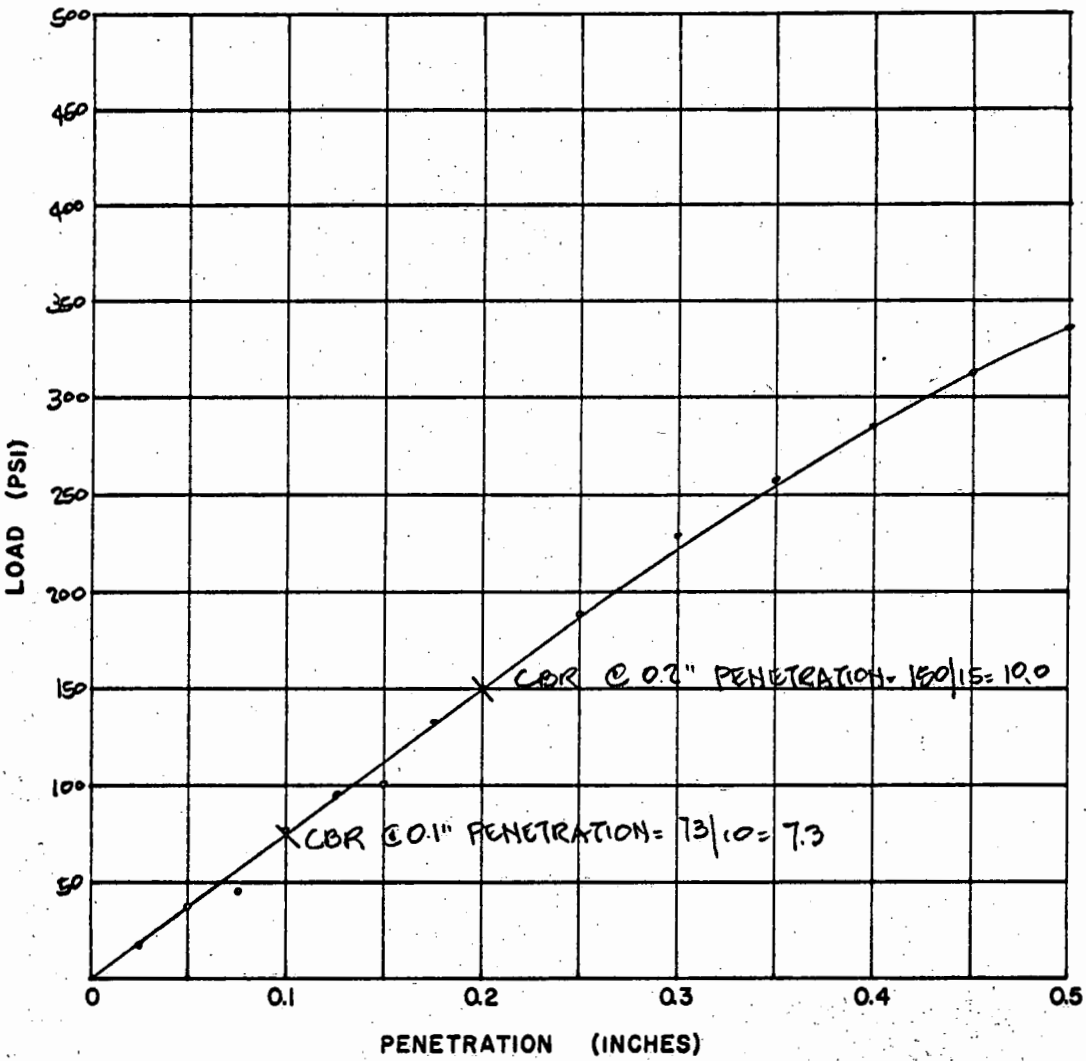
CBR TEST

PROJECT: AIEA LANI ESTATES

LOCATION: AIEA HEIGHTS, EWA, OAHU, HAWAII

SAMPLE NO: 1 SURFACE

SAMPLE DESCRIPTION: BROWN CLAYEY SILT W/ROOTS



CBR PENETRATION DATA

PENETRATION (INCHES)	LOAD (LBS.)	LOAD (PSI)
0.025	118	18
0.050	262	38
0.075	307	45
0.100	542	78
0.125	668	96
0.150	700	101
0.175	932	133
0.200	1045	150
0.250	1259	189
0.300	1344	229
0.350	1406	258
0.400	1465	285
0.450	1523	312
0.500	1574	335

AGGREGATE 1/4" MINUS

HAMMER WEIGHT 10LBS.

HAMMER DROP 18"

No. OF BLOWS 56/LAYER

No. OF LAYERS 5

TEST RESULTS:

MOLDING MOISTURE, %. 31.9

MOLDING DRY DENSITY, P.C.F. 93.0

CBR @ 0.1" PENETRATION 7.3

DAYS SOAKED 4

DATE 4-27-72 BY MO

DATE 5-1-72 BY SK

WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

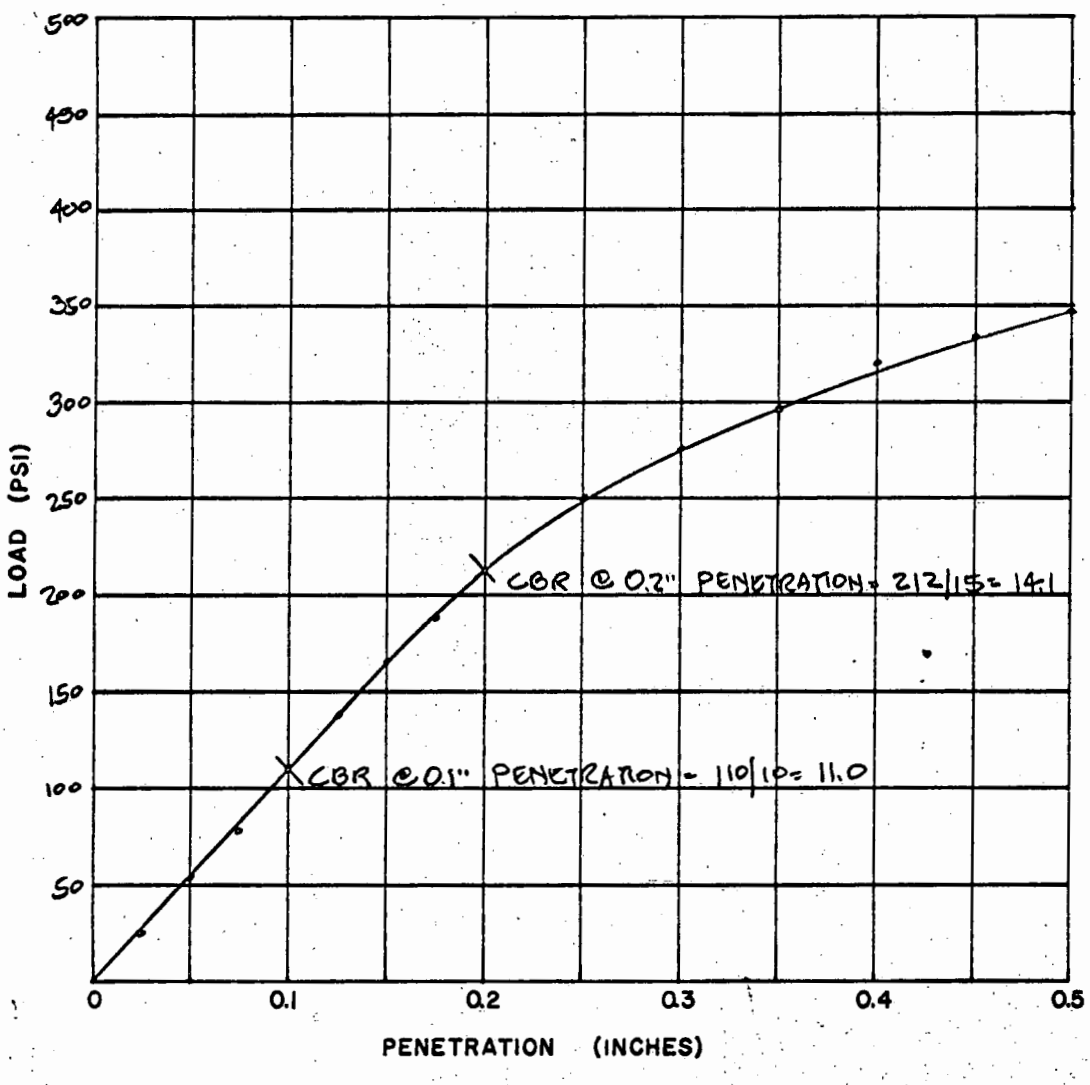
CBR TEST

PROJECT: AIEA LANI ESTATES

LOCATION: AIEA HEIGHTS, EWA, OAHU, HAWAII

SAMPLE NO: 4 SURFACE

SAMPLE DESCRIPTION: BROWN CLAYEY SILT W/ROOTS



CBR PENETRATION DATA

PENETRATION (INCHES)	LOAD (LBS.)	LOAD (PSI)
0.025	70	23
0.050	160	53
0.075	235	78
0.100	330	110
0.125	415	138
0.150	495	165
0.175	565	188
0.200	635	212
0.250	750	250
0.300	825	275
0.350	890	297
0.400	960	320
0.450	1000	333
0.500	1040	347

AGGREGATE 1/4" MINUS

HAMMER WEIGHT 10 LBS.

HAMMER DROP 18"

No. OF BLOWS 56/LAYER

No. OF LAYERS 5

TEST RESULTS:

MOLDING MOISTURE, %. 40.3

MOLDING DRY DENSITY, P.C.F. 81.7

CBR @ 0.1" PENETRATION 11.0

DAYS SOAKED 4

DATE 4-29-72 BY F.M

DATE 5-4-72 BY S.K.

WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

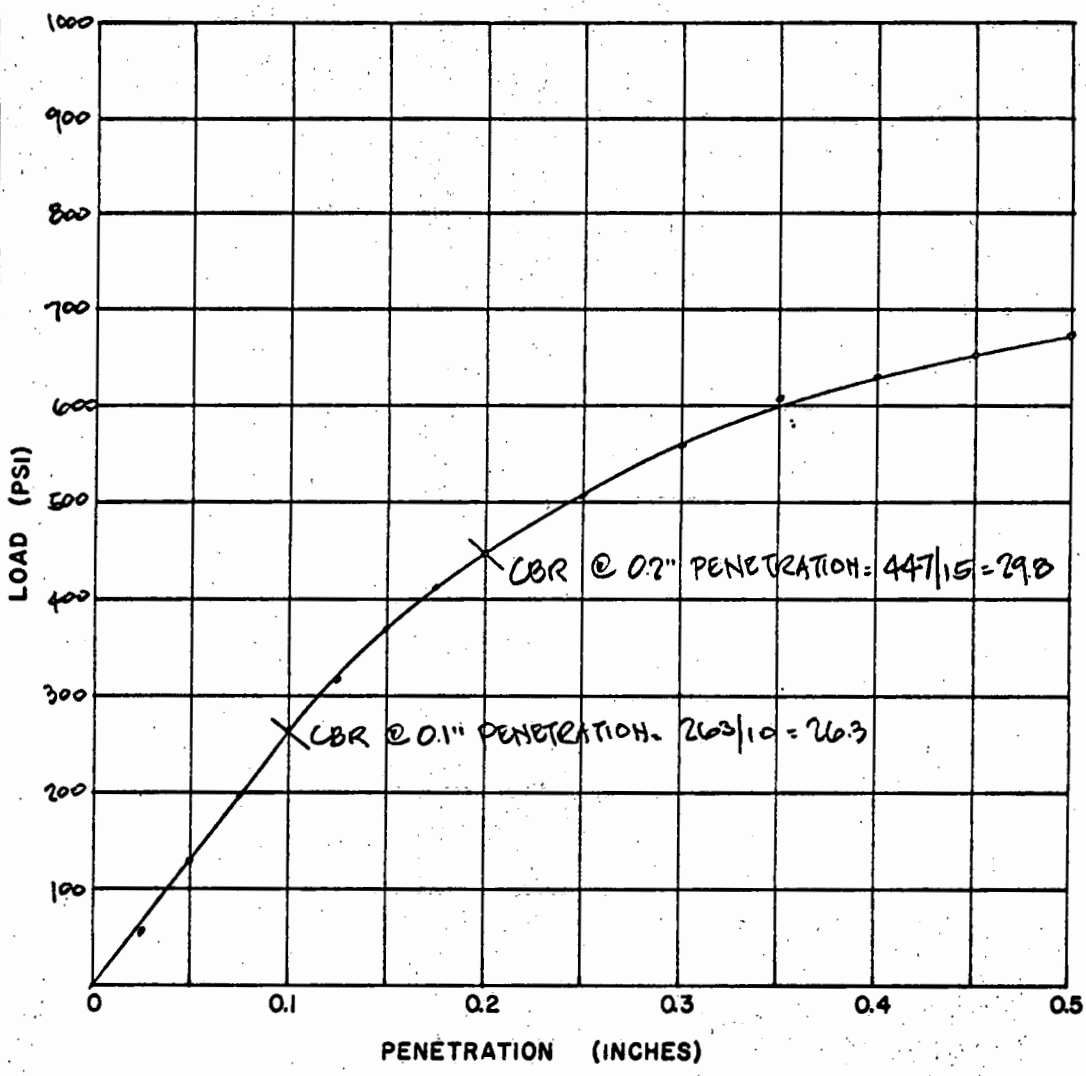
CBR TEST

PROJECT: AIEA LANI ESTATES

LOCATION: AIEA HEIGHTS, EWA, OAHU, HAWAII

SAMPLE NO: 14 SURFACE

SAMPLE DESCRIPTION: REDDISH-BROWN CLAYEY SILT



CBR PENETRATION DATA

PENETRATION (INCHES)	LOAD (LBS.)	LOAD (PSI)
0.025	170	57
0.050	385	128
0.075	590	197
0.100	790	263
0.125	950	317
0.150	1110	370
0.175	1240	413
0.200	1340	447
0.250	1520	507
0.300	1680	560
0.350	1810	603
0.400	1880	627
0.450	1960	653
0.500	2025	675

AGGREGATE ¼" MINUS

HAMMER WEIGHT 10 LBS.

HAMMER DROP 18"

No. OF BLOWS 56/LAYER

No. OF LAYERS 5

TEST RESULTS:

MOLDING MOISTURE, %. 36.1

MOLDING DRY DENSITY, P.C.F. 84.3

CBR @ 0.1" PENETRATION 26.3

DAYS SOAKED 4

DATE 4-29-72 BY LT

DATE 5-4-72 BY SK

WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

10-470

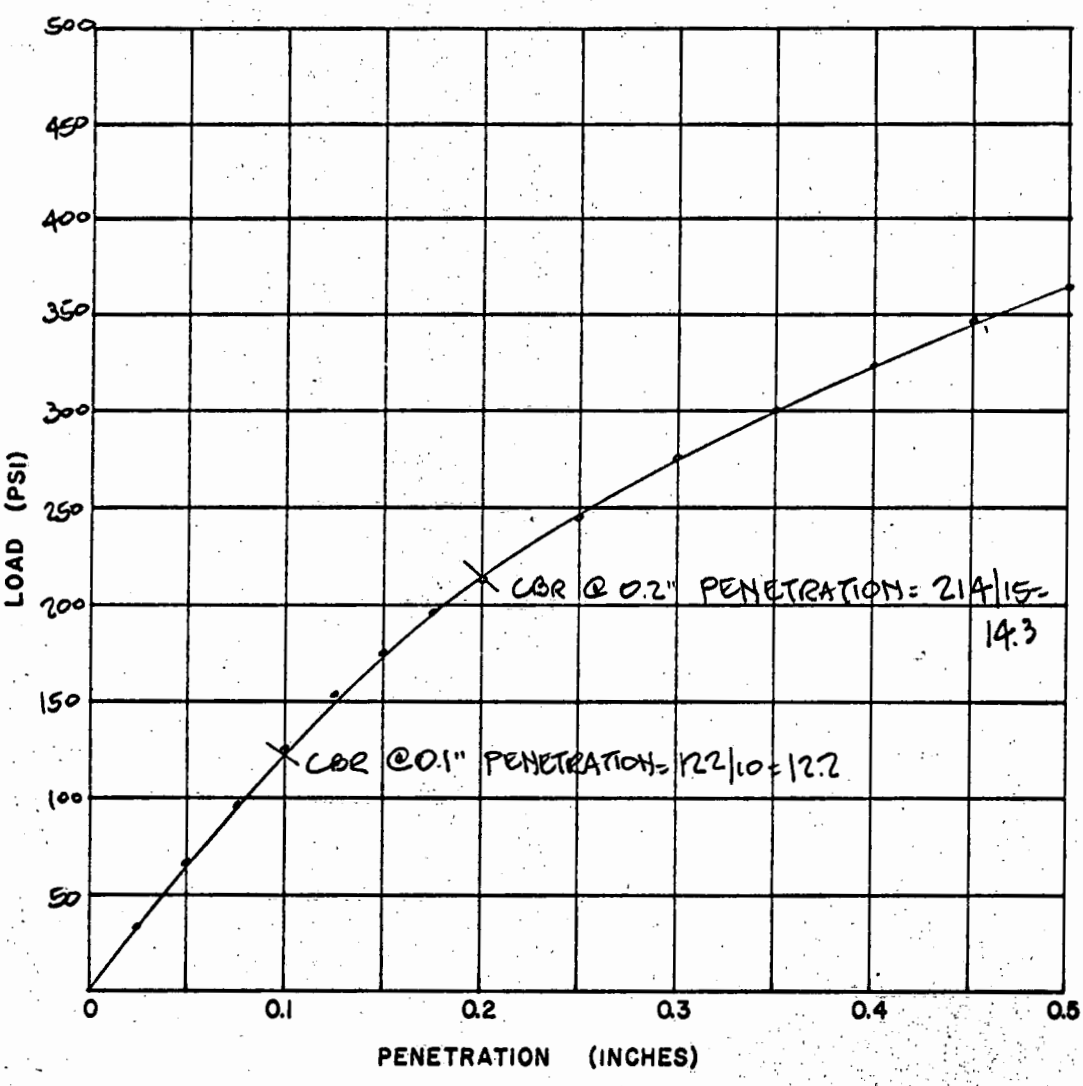
CBR TEST

PROJECT: AIEA LANI ESTATES

LOCATION: AIEA HEIGHTS, EWA, OAHU, HAWAII

SAMPLE NO: 18 SURFACE

SAMPLE DESCRIPTION: REDDISH-BROWN CLAYEY SILT W/ROOTS



CBR PENETRATION DATA

PENETRATION (INCHES)	LOAD (LBS.)	LOAD (PSI)
0.025	95	32
0.050	200	67
0.075	290	97
0.100	375	125
0.125	455	152
0.150	525	175
0.175	590	197
0.200	640	213
0.250	735	245
0.300	830	277
0.350	900	300
0.400	965	322
0.450	1040	347
0.500	1090	363

AGGREGATE ¼" MINUS

HAMMER WEIGHT 10LBS.

HAMMER DROP 18"

No. OF BLOWS 56/LAYER

No. OF LAYERS 5

TEST RESULTS:

MOLDING MOISTURE, %. 40.2

MOLDING DRY DENSITY, P.C.F. 81.4

CBR @ 0.1" PENETRATION 12.2

DAYS SOAKED 4

DATE 4-22-72 BY FM

DATE 4-27-72 BY SK

WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

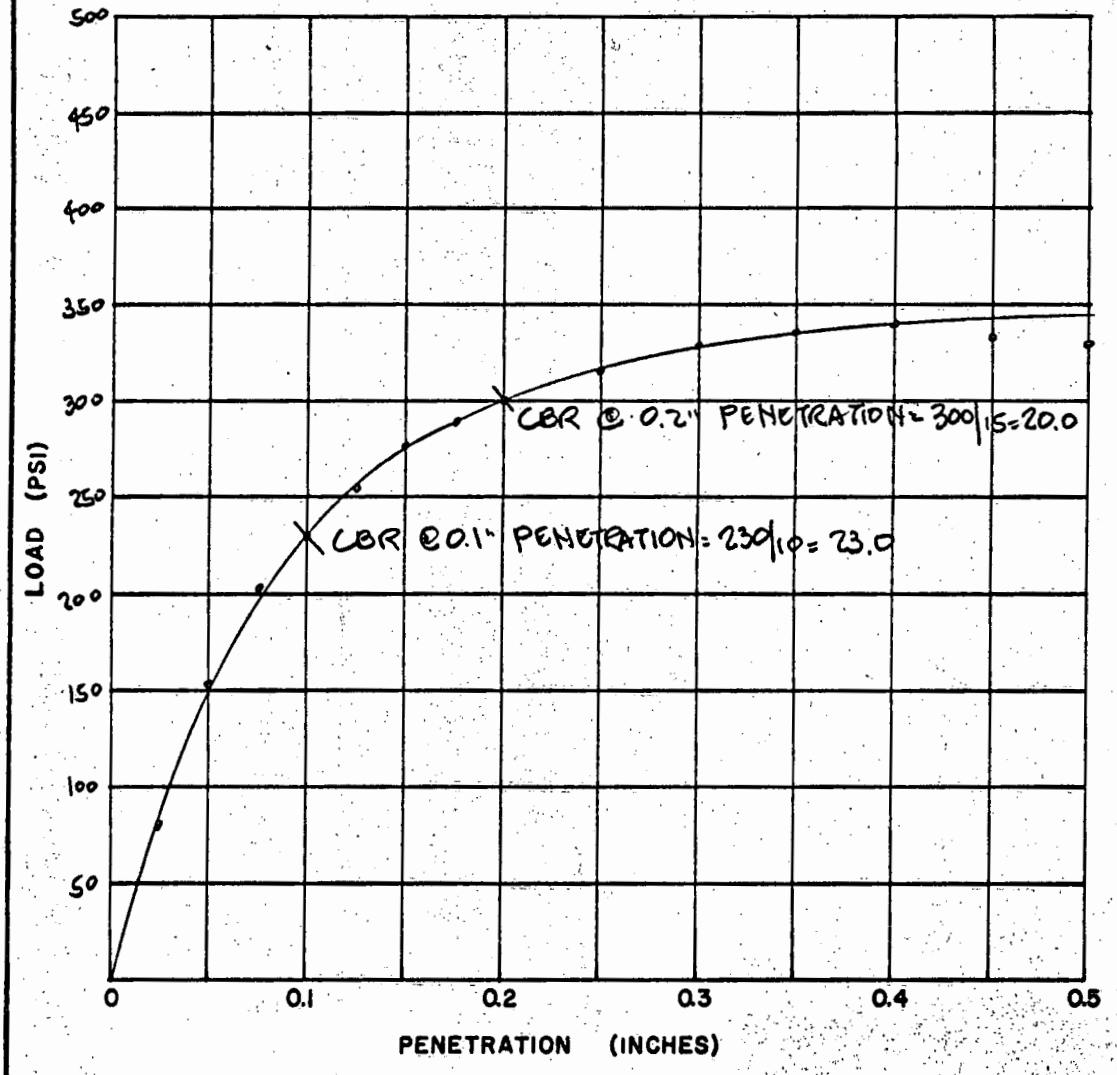
CBR TEST

PROJECT: AIEA LANI ESTATES

LOCATION: AIEA HEIGHTS, EWA, OAHU, HAWAII

SAMPLE NO: 19 SURFACE

SAMPLE DESCRIPTION: REDDISH-BROWN CLAYEY SILT



CBR PENETRATION DATA

PENETRATION (INCHES)	LOAD (LBS.)	LOAD (PSI)
0.025	240	80
0.050	460	153
0.075	610	203
0.100	690	230
0.125	765	255
0.150	830	277
0.175	870	290
0.200	900	300
0.250	950	317
0.300	990	330
0.350	1010	337
0.400	1020	340
0.450	1000	333
0.500	990	330

AGGREGATE ¼" MINUS

HAMMER WEIGHT 10 LBS.

HAMMER DROP 18"

No. OF BLOWS 56/LAYER

No. OF LAYERS 5

TEST RESULTS:

MOLDING MOISTURE, %. 38.0

MOLDING DRY DENSITY, P.C.F. 83.9

CBR @ 0.1" PENETRATION 23.0

DAYS SOAKED 5

DATE 4-26-72 BY MO

DATE 5-2-72 BY SK

WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

10-470

GENERAL TESTING METHODS

EXPLORATORY BORINGS AND SAMPLING

Method for soil investigation and sampling by auger borings (Tentative)	ASTM Designation: D 1452-63T
Method for thin wall tube sampling of soils (Tentative)	ASTM Designation: D 1587-63T
Method for penetration test and split barrel sampling of soils (Tentative)	ASTM Designation: D 1586-64T

LABORATORY TESTING

Grading Analysis

Sieve analysis of fine and coarse aggregates	AASHO Designation: T 27-60
Amount of material finer than No. 200 sieve in aggregate	AASHO Designation: T 11-60

Atterberg Limits

Determining the liquid limit of soils Modified as follows: Substitute Casagrande grooving tool. Tests conducted from natural moisture content unless noted otherwise.	AASHO Designation: T 89-60
Determining the plastic limit of soils	AASHO Designation: T 90-56
Calculating the plasticity index of soils	AASHO Designation: T 91-54

Specific Gravity

Specific gravity of soils Modified as follows: 500 ML Pycnometer	AASHO Designation: T 100-60

Expansion and CBR Tests

Expansion test and California Bearing Ratio (CBR)	Section VIII - TM 5-530 "Materials Testing" by Headquarters, Dept. of the Army

Compaction Test

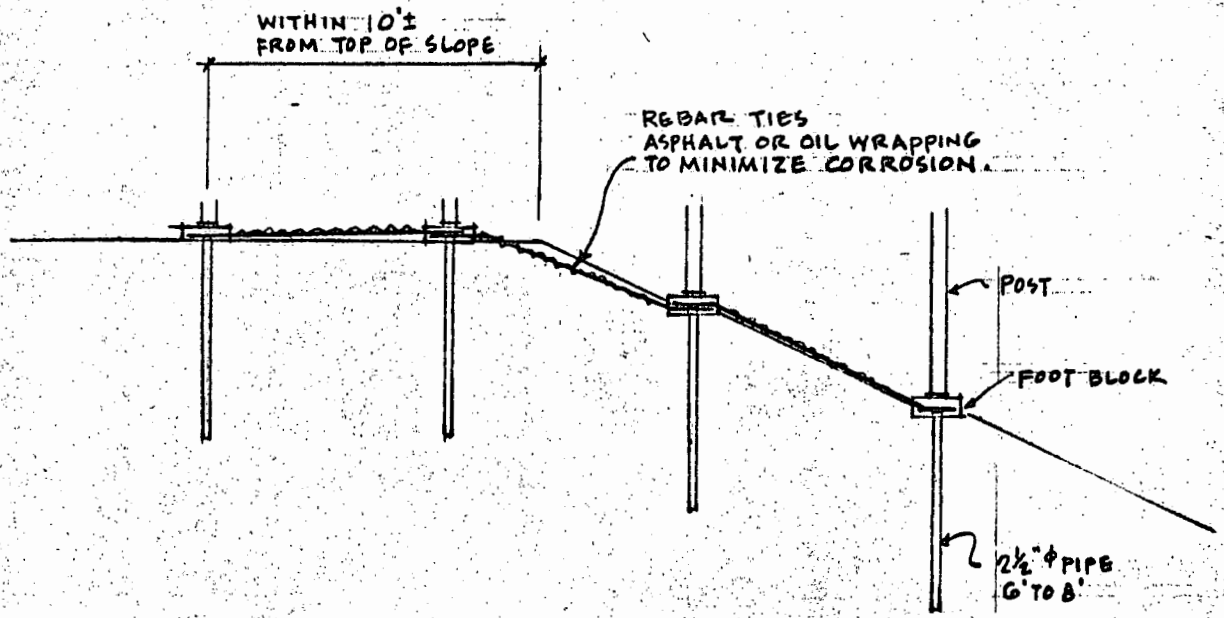
Moisture-Density relations of soils using a 10# rammer and an 18" drop	AASHO Designation: T 180-57

Unified Soil Classification

Designation E-3 from "Earth Manual" by the United States Department of the Interior Bureau of Reclamation

GENERAL TESTING METHODS

Consolidation Test	Chapter IX "Soil Testing for Engineers" by T. William Lambe The Massachusetts Institute of Technology
Laboratory Shear Test	
Laboratory shear test using the Torvane	Brochure by Soiltest, Inc.



SECTION

NOT TO SCALE

FIGURE 1

SUGGESTED FOOTINGS NEXT TO OR ALONG TOP OF BANK

AIEA LANI ESTATES

AIEA HEIGHTS, EWA, OAHU, HAWAII

TMK 9-9-07:1

WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

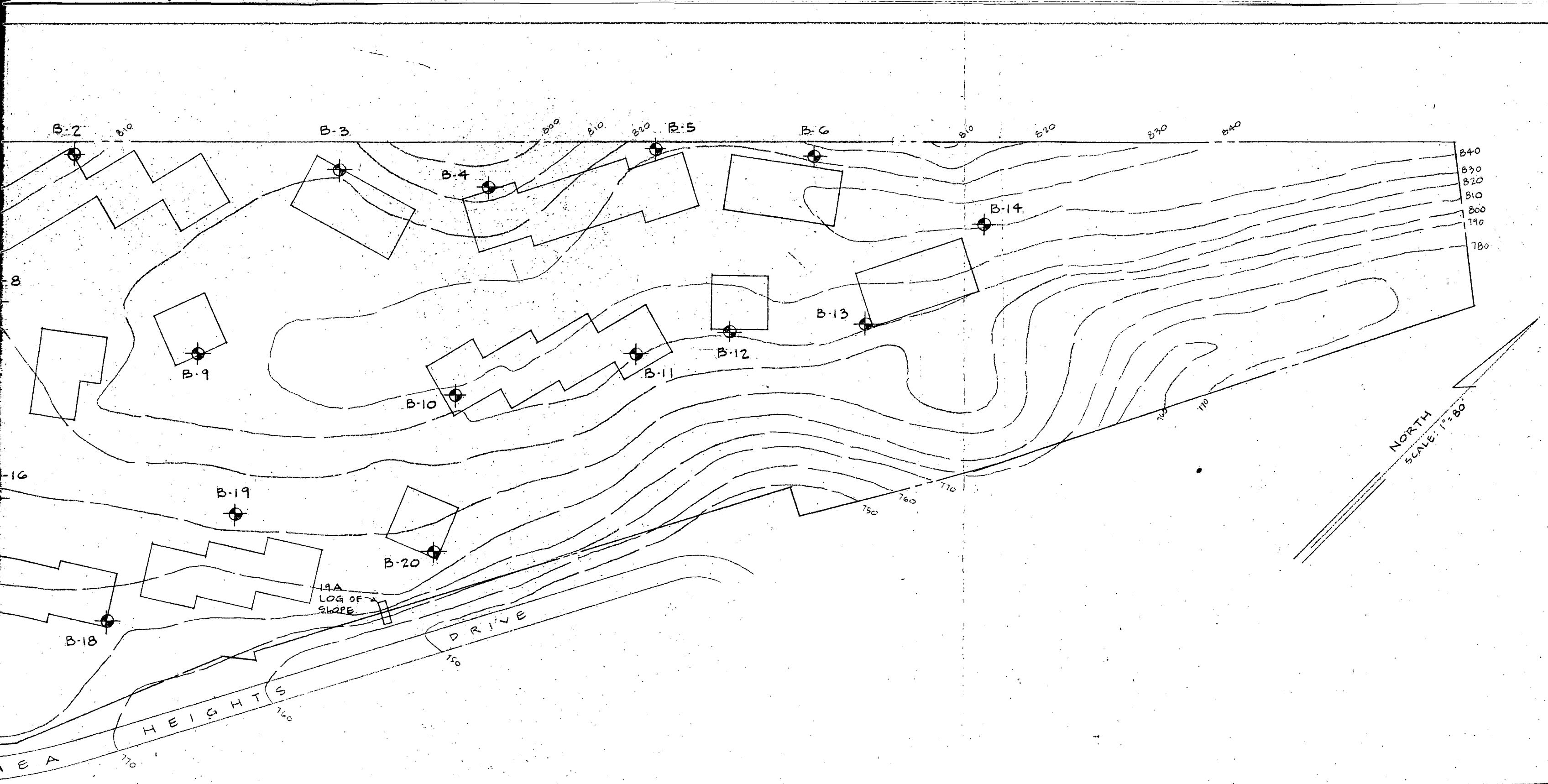
LIMITATIONS

In general, soil formations are commonly erratic and rarely uniform or regular. The boring logs indicate the approximate subsurface soil conditions encountered only at the drill holes where the borings were made at the times designated on the logs and may not represent conditions at other locations or at other dates. Soil conditions and water levels may change with the passage of time and construction methods or improvements at the site.

During construction, should subsurface conditions much different from those in the borings be observed, encountered, or otherwise indicated, we should be advised immediately to review or reconsider our recommendations in light of the new developments.

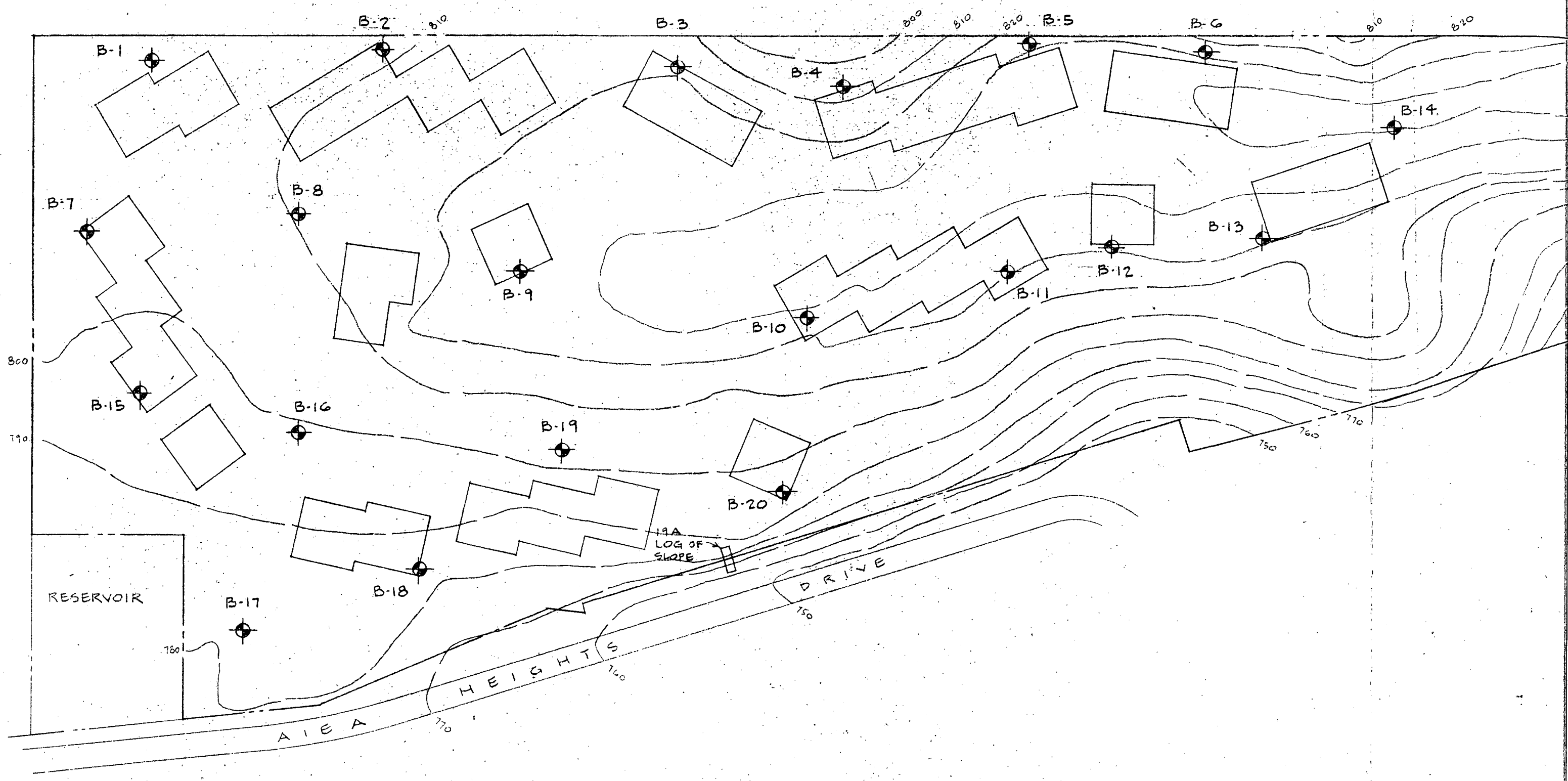
If there is a substantial lapse of time between the submission of this report and the start of work at the site, or if conditions have changed due to natural causes, plan changes, or construction operations at or adjacent to the site, it is recommended that this report be reviewed to determine the applicability of the recommendations considering the time lapse and the changed conditions.

Our professional services were performed, findings obtained and recommendations prepared in accordance with generally accepted engineering practices. This warranty is in lieu of all other warranties expressed or implied.



BORING LOCATION PLAN
AIEA LANI ESTATES
AIEA HEIGHTS, OAHU, HAWAII
TAX MAP KEY: 9-9-07 : 1

Dr. EH	WALTER LUM ASSOCIATES, INC. 3030 WAIALAE AVE. CIVIL ENGINEERS PHONE 737-7931	Sheet
Date 5/72		of
Rev.		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770
760
750
780
19A
LOG OF
SLOPE
RESERVOIR
AIEA HEIGHTS DRIVE